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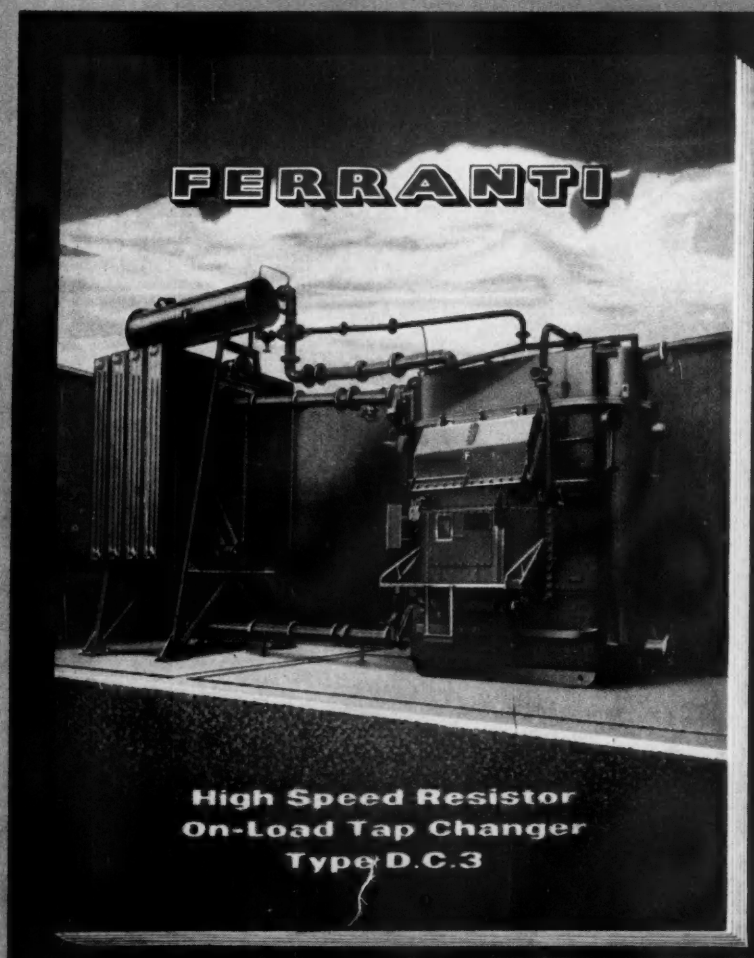
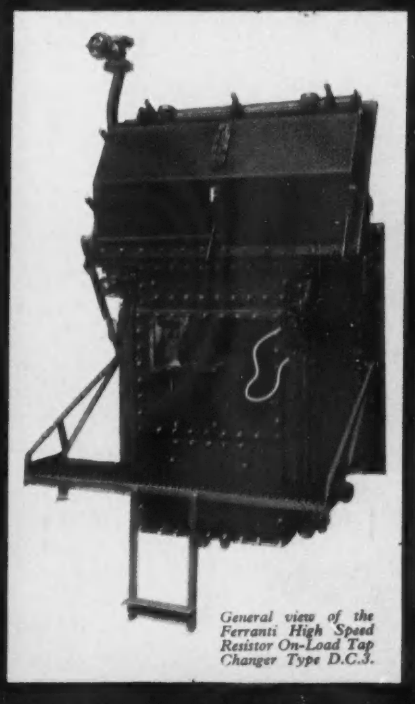
ELECTRICAL TIMES





General view of the Ferranti High Speed Resistor On-Load Tap Changer Type D.C.3.

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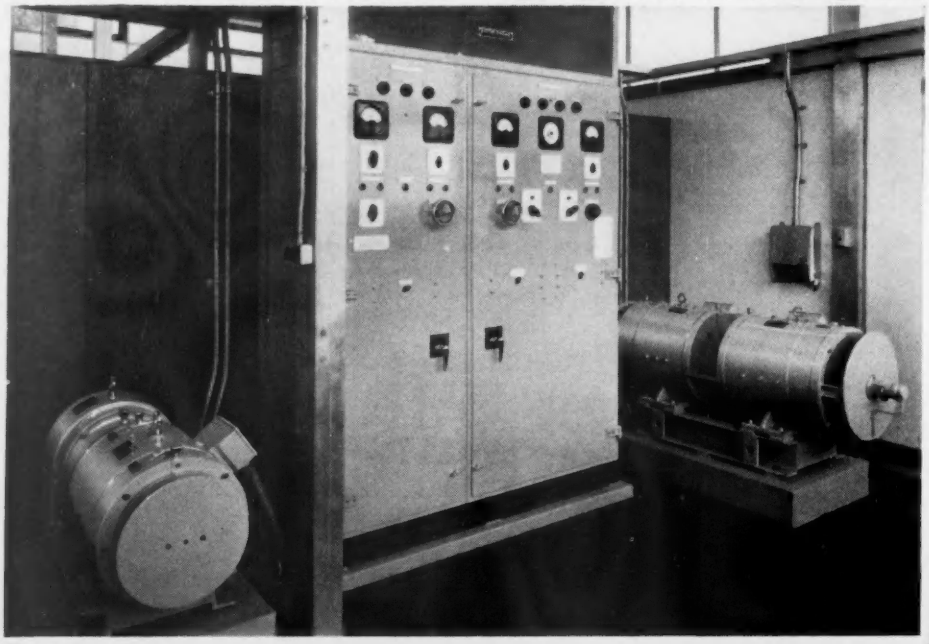

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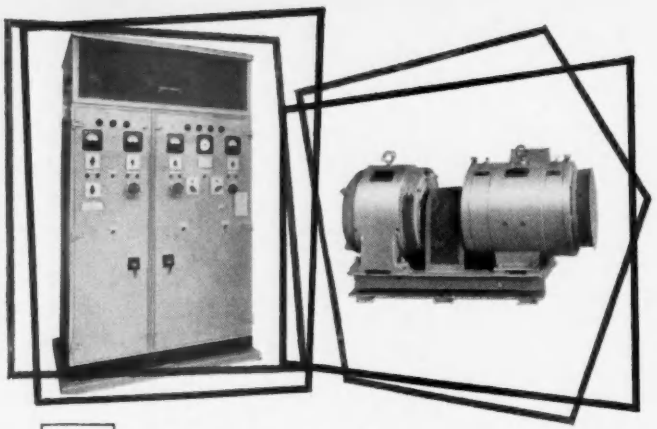

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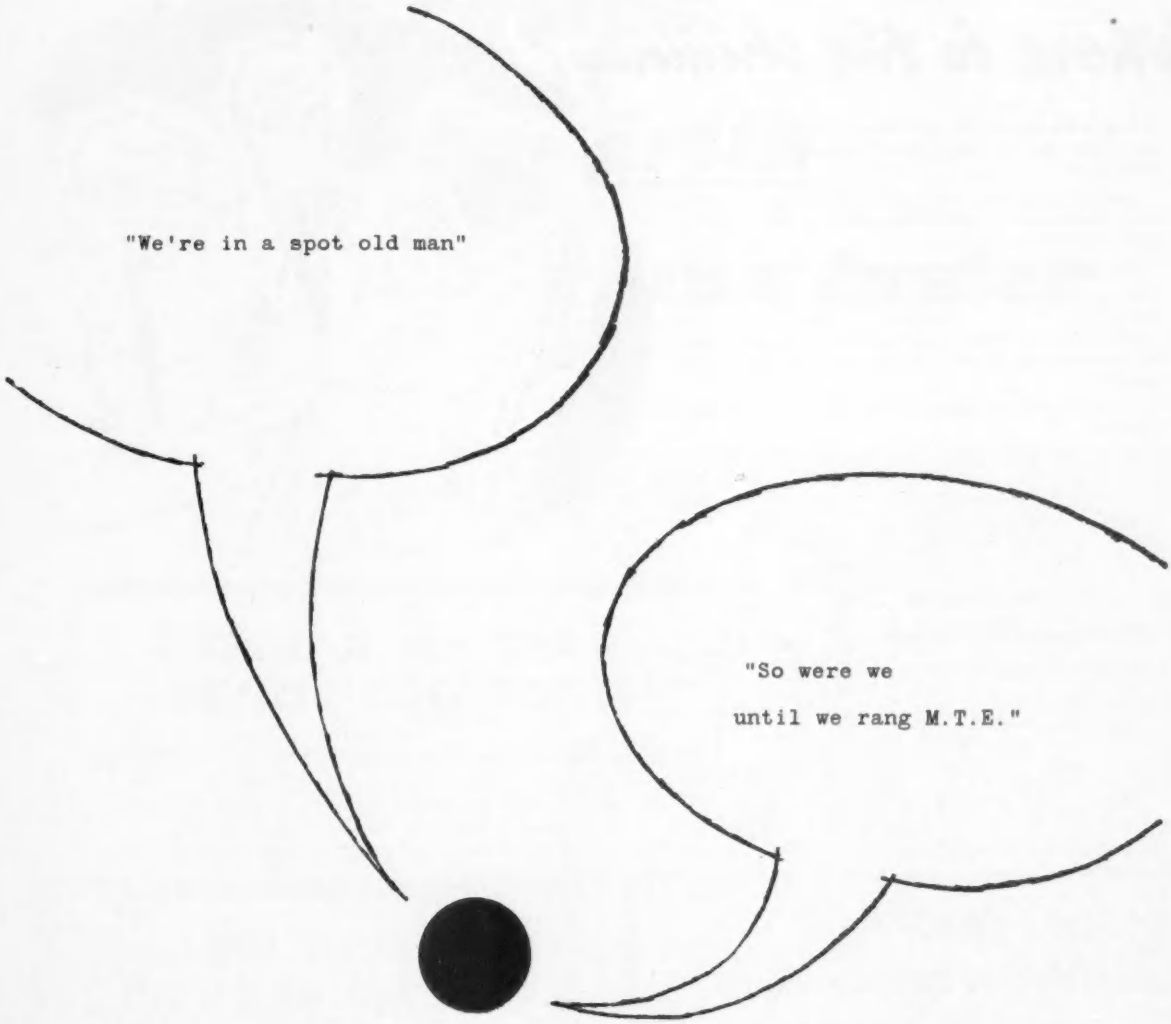

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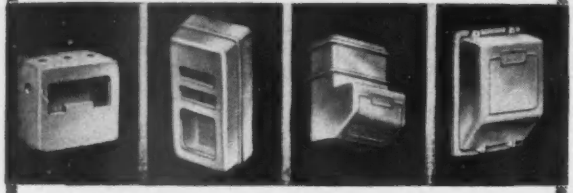

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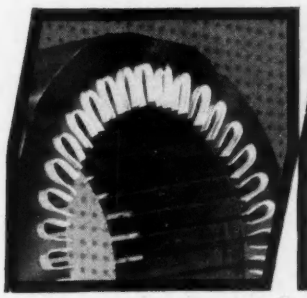

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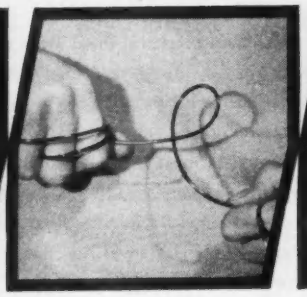
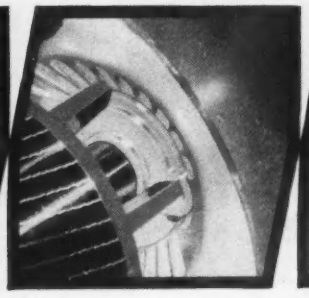
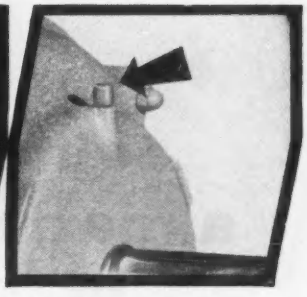


Tough but pliable wire covering of phenolic resin.



Grids on air deflectors prevent entry of rodents.



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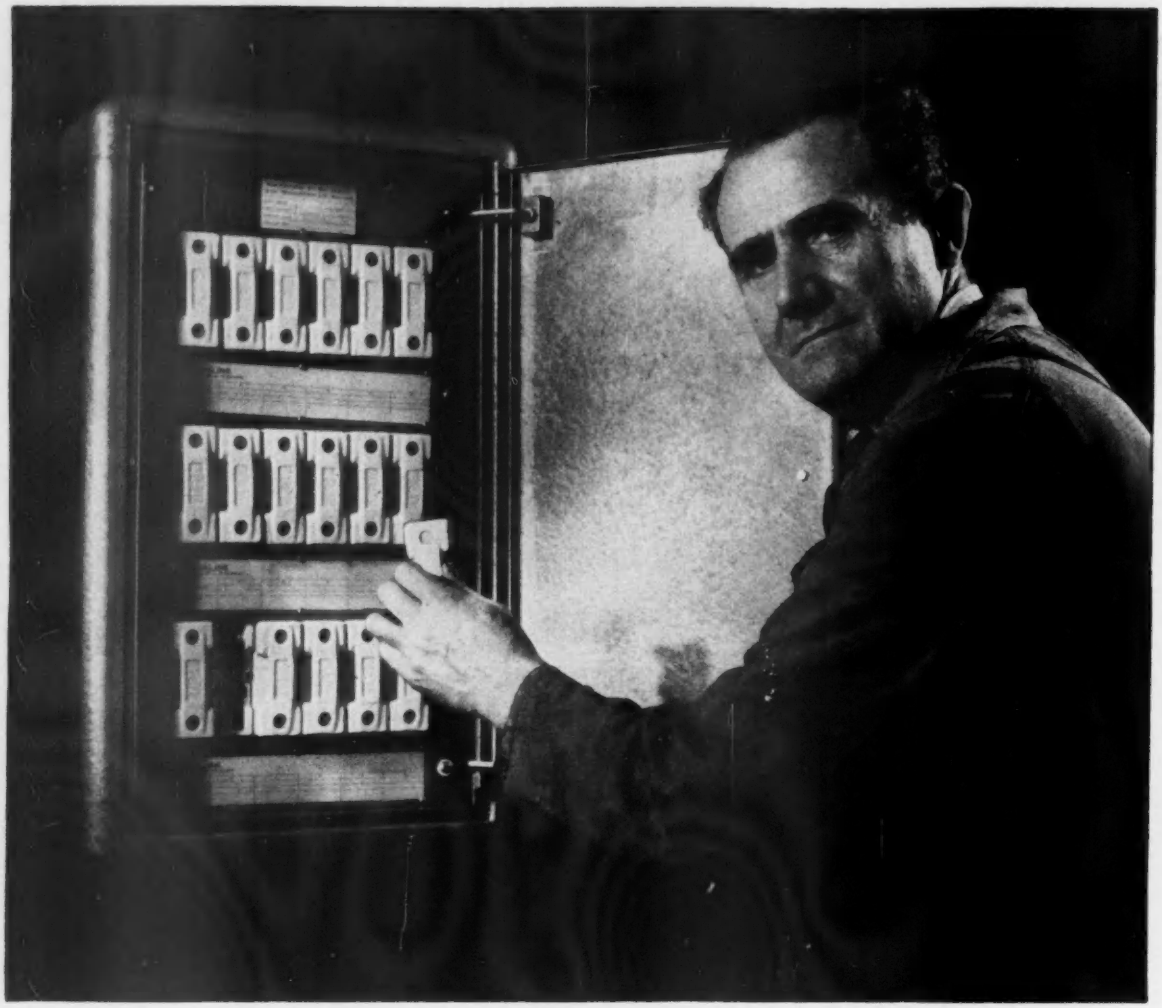

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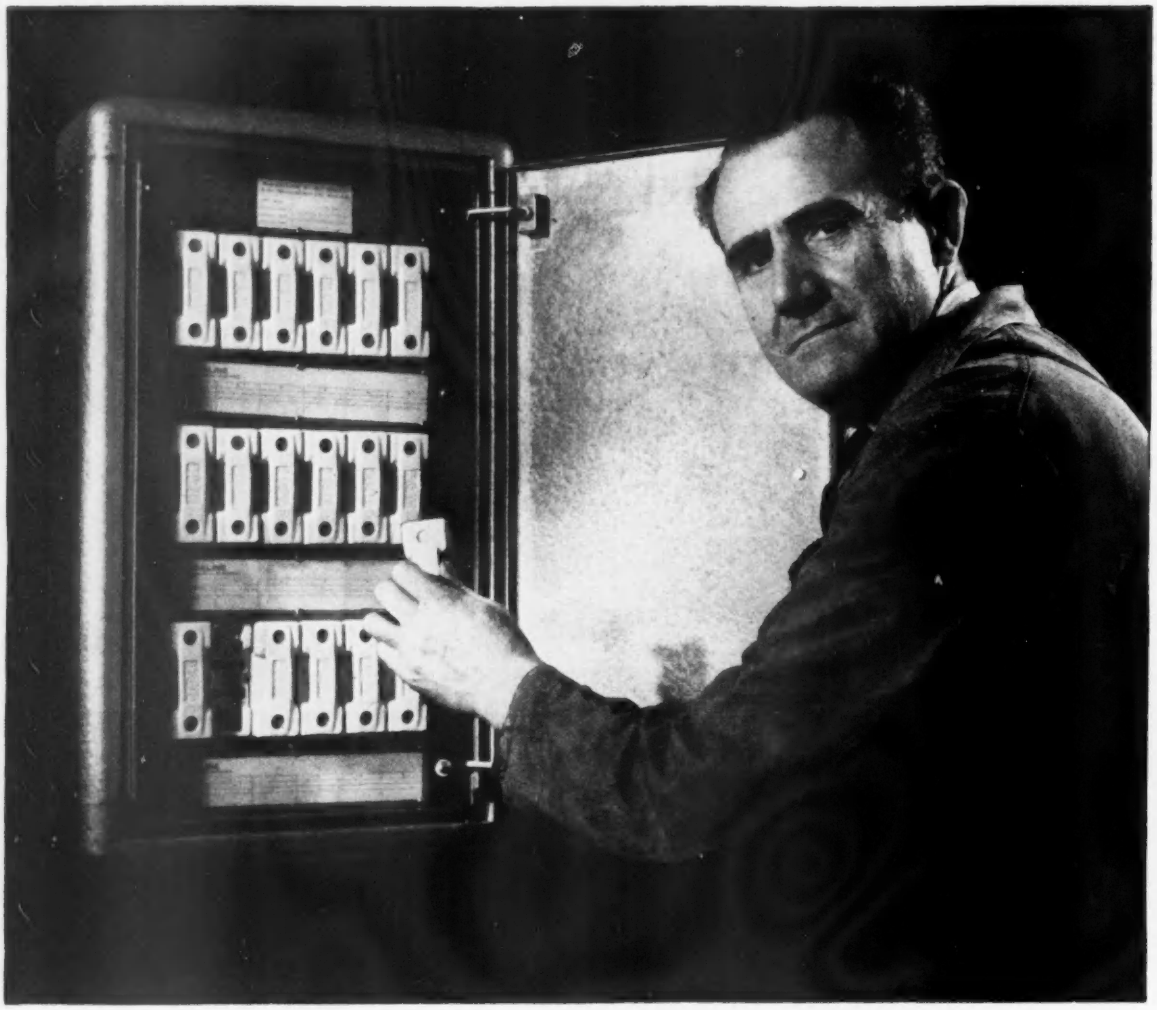

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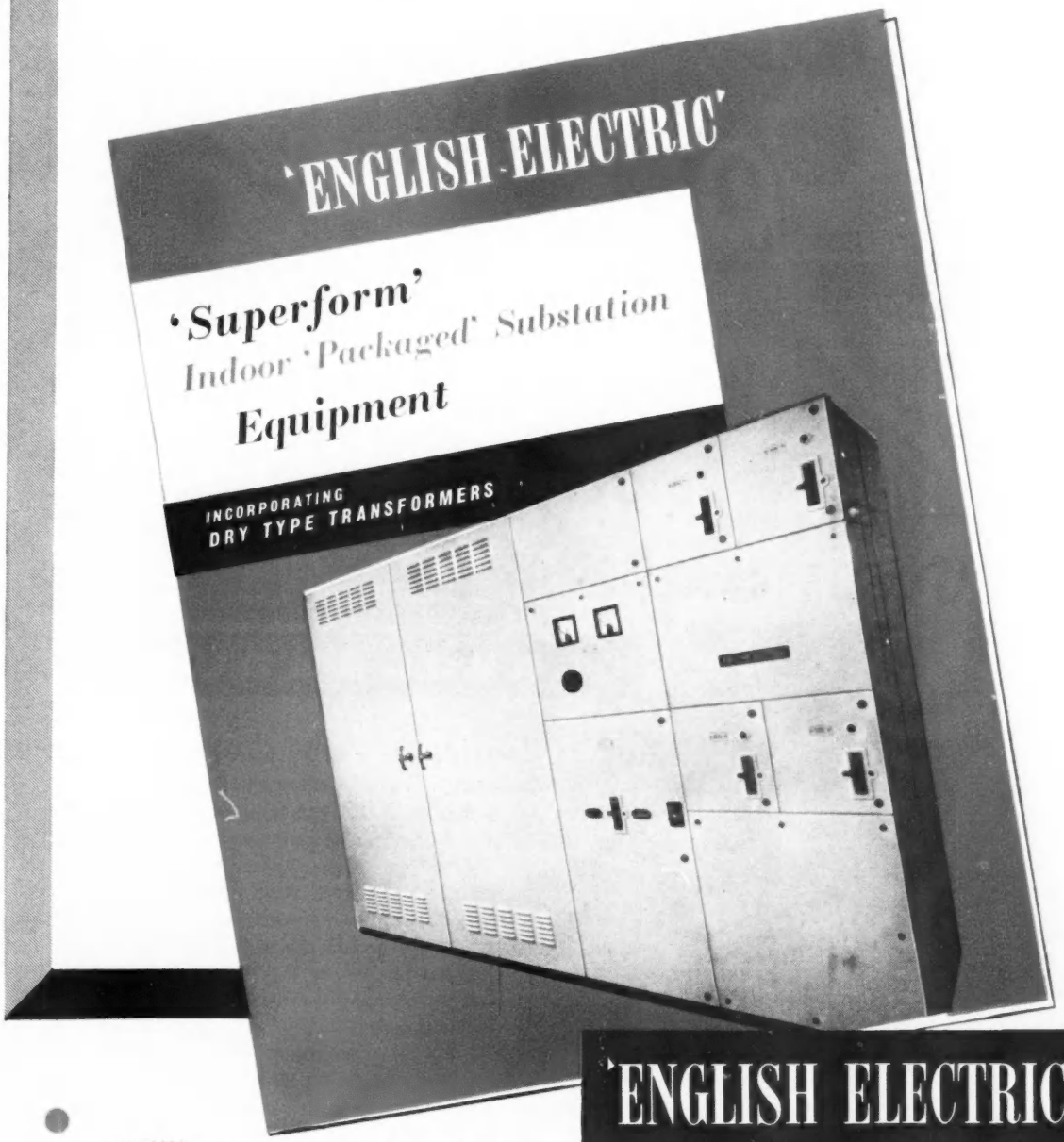
what is a 'Packaged' Substation ?



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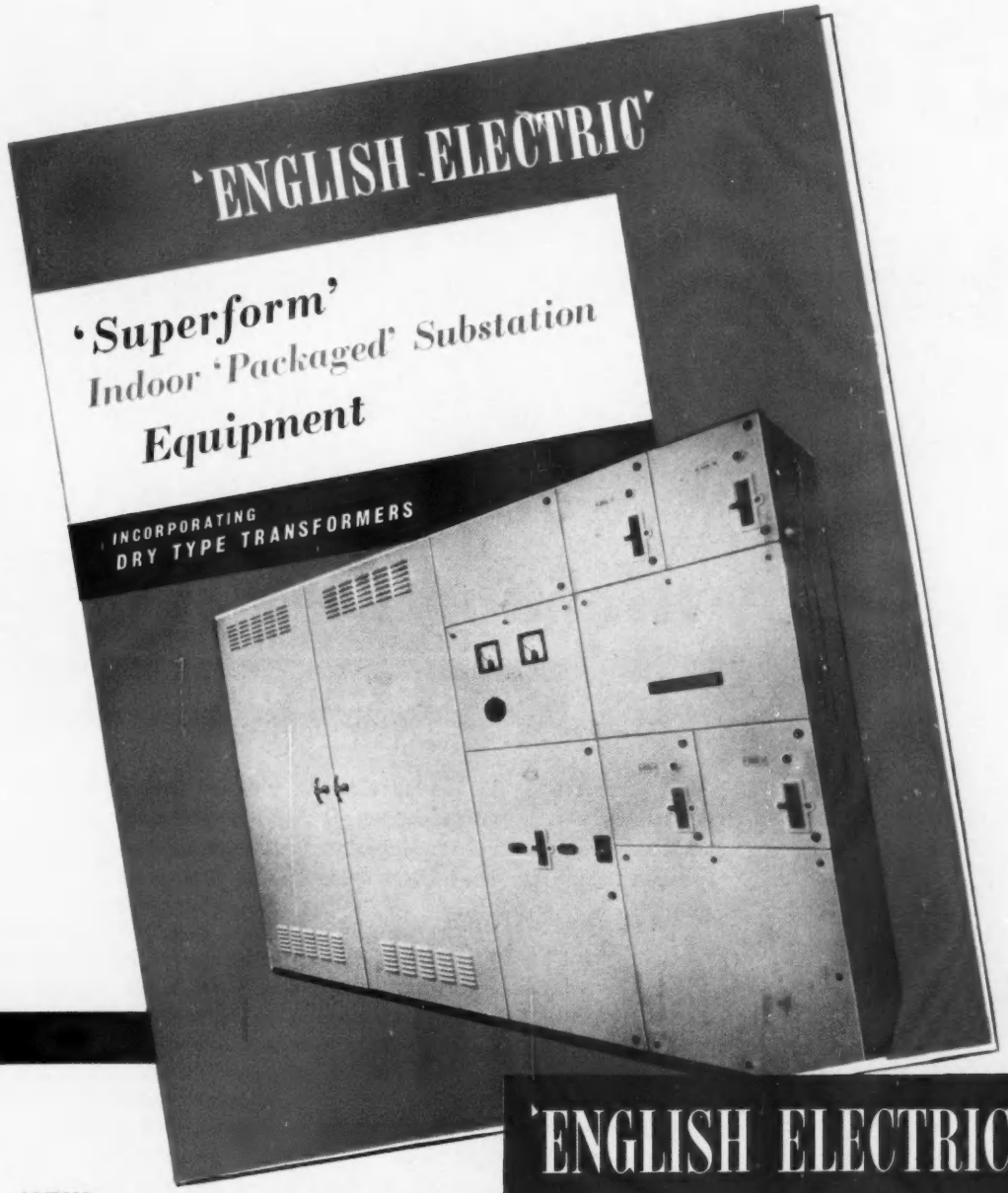

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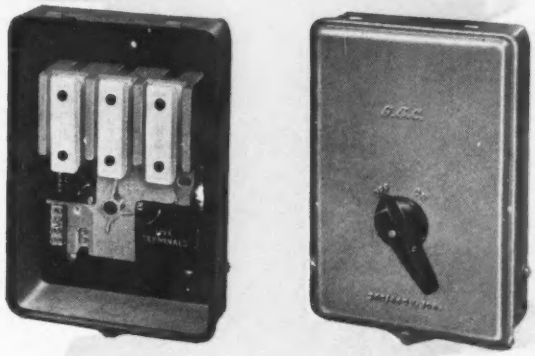

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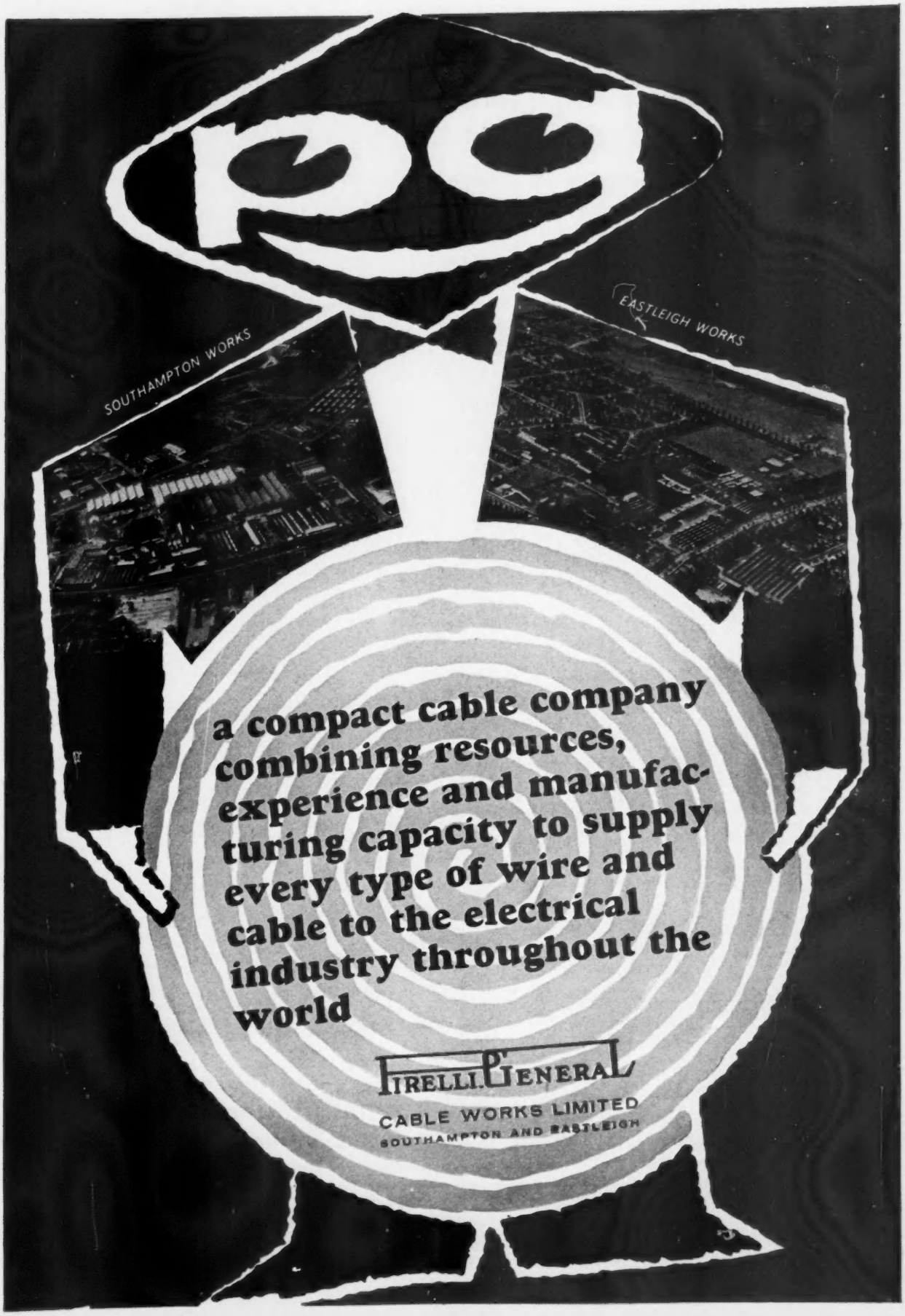
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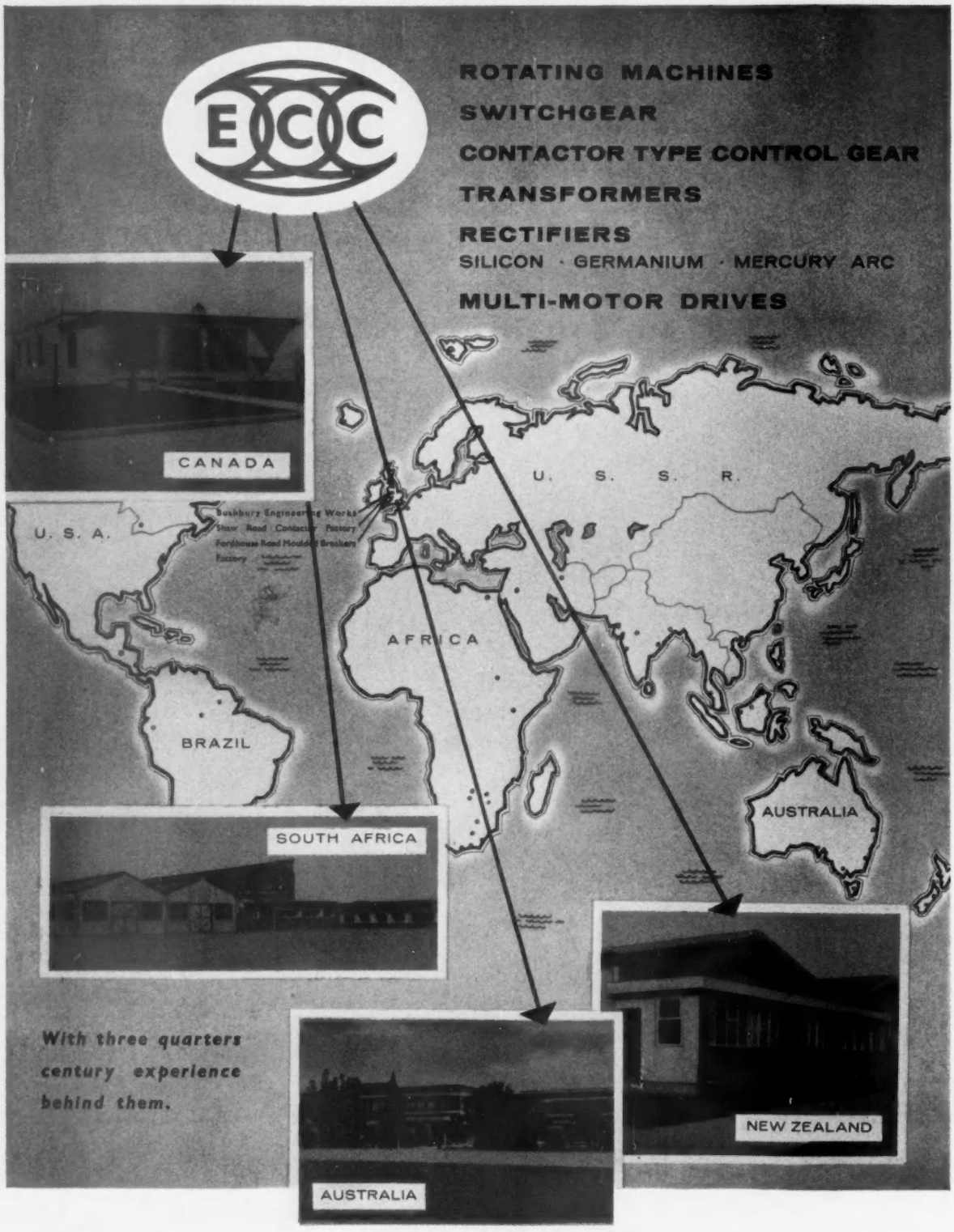

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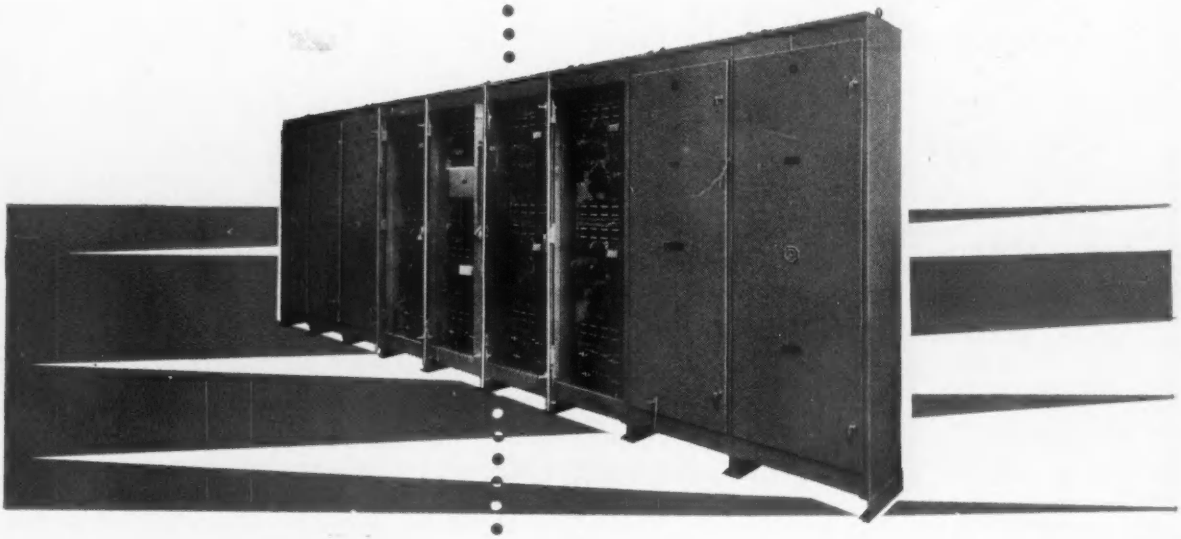

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INS.57

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It's aluminium

Sheathed in *seamless* extruded aluminium, this cable is lightweight yet strong. It needs no armouring, thus allowing simple cable design. With a high resistance to vibration fatigue, it can be used with complete safety, alongside railways etc.

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Corrugation results in greater flexibility, permitting the same bending radius as a lead sheathed cable. Not only are handling qualities improved but corrugation reduces the required thickness of the sheath *by one half*.

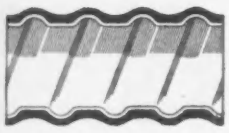
It's a money saver

Initial costs are therefore lower than conventional type cables of similar performance. Lightness and flexibility simplify transportation and installation. No special precautions are necessary to allow for expansion and contraction.

Further information is available on request.

It's the BICC C.S.A. cable

CORRUGATED
SEAMLESS
ALUMINIUM



PROTECTIVE SERVING

Anti-corrosion protection is provided by an extruded P.V.C. covering which fits tightly over the whole sheath surface. *See section view.*

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Conventional installation procedure is followed. Jointing techniques are the same as for normal smooth aluminium-sheathed cables.

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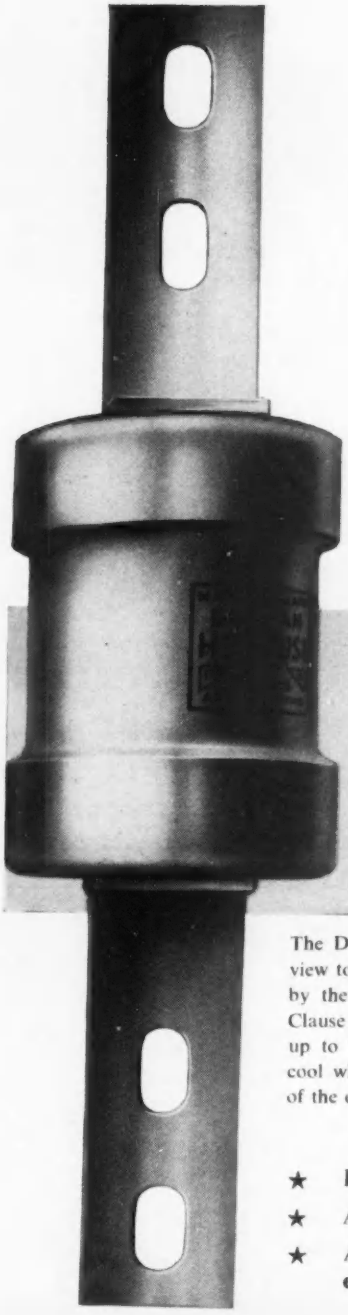
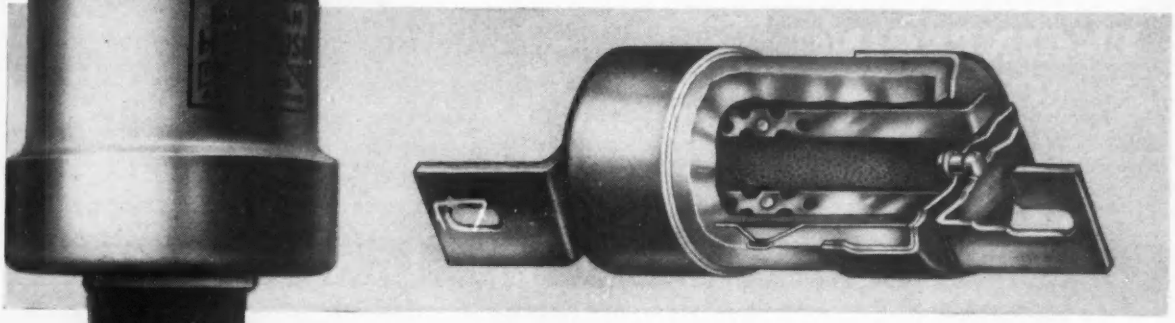


DORMAN

TYPE 'Q' H.R.C.
cartridge fuse links up to 800 amp. rating



The Dorman type 'Q' H.R.C. Cartridge Fuse Link has been designed and developed with a view to achieving a fusing efficiency hitherto unknown. It has been subjected to stringent tests by the Association of Short-Circuit Testing Authorities, in accordance with B.S. 88, 1952, Clause 8 and having passed such tests successfully has received A.S.T.A. Certificates for ratings up to 800 amp. for category of duty 440v. In actual performance the fuse link remains cool when carrying its full load and, due to the special construction of the element, is consistent in operation.

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POSITION.....

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COOLING RADIATORS
FOR TRANSFORMERS RECTIFIERS AND REGULATORS

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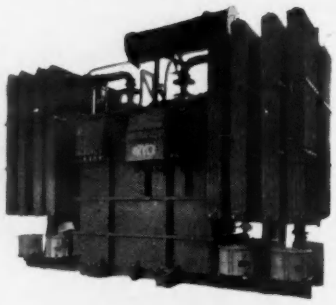

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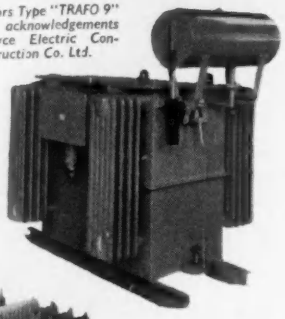

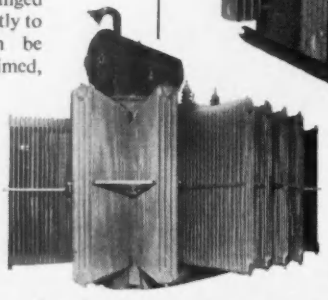

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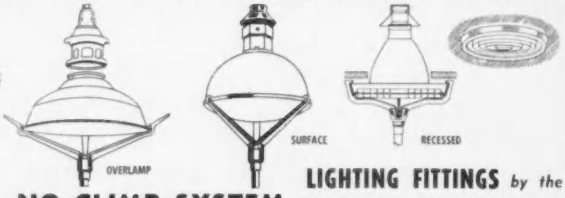

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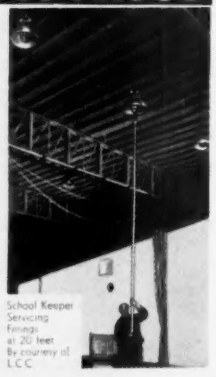

School Keeper Servicing Fittings at 20 feet. By courtesy of L.C.C.

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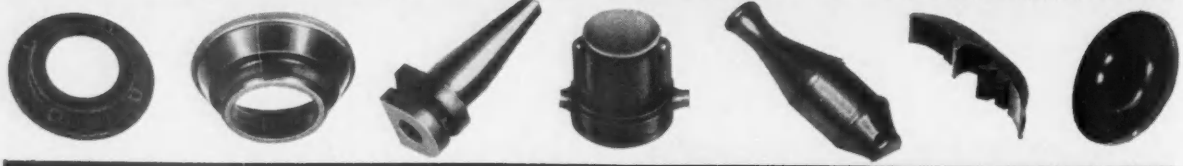

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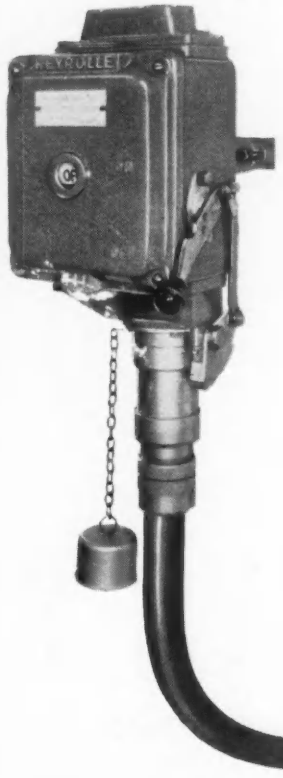


HH SWITCH AND PLUG UNIT

This new 60-ampere 550-volt switch-and-plug unit is capable of working continuously at full load in heavy industrial conditions and is ideal for controlling welding circuits.

SPECIFICATION

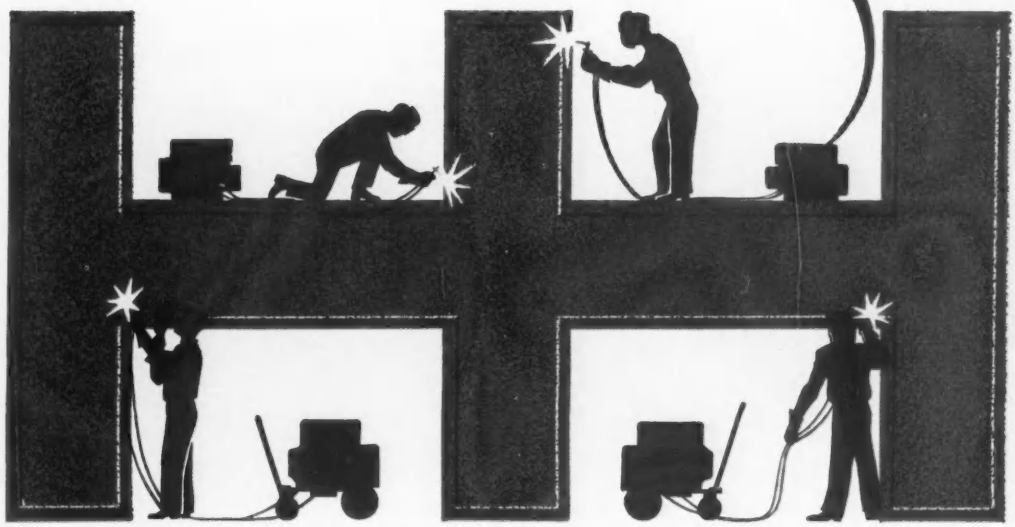
SWITCH: The latest Reyrolle HH design rated at 60 amperes 550 volts and capable of making and breaking current-surges of up to 360 amperes at 0·3 P.F.

PLUG AND SOCKET: A new addition to the Reyrolle "Easigo" range for industrial duty, available for D.P., T.P., or T.P. & N. service with scraping-earth connection.

INTERLOCKS: The switch cannot be closed with the plug withdrawn or the plug removed while the switch is 'ON'.

PROTECTION: An interlocked fuse-unit can be added if required.

Other switch-and-plug units of up to 300-ampere rating are also available.



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DRAWOUT RELAYS BY

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Sequential interlocking safeguards ' Comprehensive testing facilities
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Instrumentation Division—Instrument & Meter Department
TRAFFORD PARK, MANCHESTER 17
G/A001

THURSDAY 27 OCTOBER, 1960
Registered as a Newspaper Volume 138 No. 17

Dans ce numéro

Essais synthéthiques des fusibles 629

Un circuit d'inductance—capacitance peut être employé pour vérifier le rendement de court circuit de fusibles. Il est un peu plus difficile à ajuster que l'est un alternateur, ne donne pas de courants asymétriques et manque de donner une récupération complète de voltage une fois que le fusible ait opéré. D'autre part, l'installation, l'opération et le maintien en sont beaucoup moins coûteux que dans le cas d'un alternateur. Il est pratiquement l'équivalent de cet alternateur lorsqu'il est question d'effectuer des essais de fusibles qui opèrent rapidement avec un courant cut-off et une libération d'énergie réduits.

Le Cuivre pour Matériel Electrique 633

Les propriétés du cuivre comme conducteur d'électricité sont en bonne harmonie avec les développements qu'il est possible de prévoir pour les projets de la technique électrique. Pour les transformateurs, l'usage de feuillards d'acier laminé à froid a réduit de beaucoup la quantité de cuivre employé pour un pourcentage donné de perte de cuivre. Des conducteurs de cuivre refroidis intérieurement dans de gros alternateurs n'ont révélé aucun ennui de corrosion. Le cuivre est plein de promesses en ce qui concerne l'opération d'une température tout près du zéro absolu.

Contrôle pour Laminoirs d'Aluminium—2ième Partie 635

Les amplificateurs magnétiques sont très couramment utilisés pour le matériel de contrôle automatique pour un laminoir réversible chaud pour le laminage de lingots d'aluminium. Le laminoir est actionné par deux moteurs de 4,000 C.V. chacun, courant direct, fourni par un groupe Ilgner. Ce groupe est alimenté par un moteur à courant direct avec dispositif liquide de résistance dont la fonction est de limiter la charge du courant. La commande des tables principles est assurée par des moteurs à courant direct, par l'entremise de convertisseurs à arc au mercure, permettant aux moteurs de régénérer et d'inverser le sens de la marche.

In dieser Nummer

Kunstprüfung von Sicherungen 629

Sicherungen lassen sich auf ihre Kurzschlussleistung mit Hilfe eines induktiv-kapazitiven Stromkreises prüfen. Eine Anordnung dieser Art ist zwar nicht so leicht einzustellen wie ein Wechselstromgenerator, gibt keinen asymmetrischen Strom ab und kann u.U. dazu führen, dass die volle Spannung nach Betätigung der Sicherung nicht wiederkehrt. Andererseits aber ist sie billiger in der Anschaffung und Instandhaltung als ein Wechselstromerzeuger und ist diesem praktisch gleichwertig sofern es sich um die Prüfung von Sicherungen handelt, die schnell ansprechen und zwar mit neidriger Abschaltleistung unter Freigabe nur geringer Energiemengen.

Kupfer als Werkstoff beim Bau elektrischer Geräte 633

Als elektrisch leitender Werkstoff weist Kupfer Eigenschaften auf, die den Bedürfnissen der voraussichtlichen Entwicklungen auf elektrotechnischem Gebiet entgegenkommen. Im Transformatorenbau z.B. führt die Verwendung kaltgewalzter Stahlbänder als Werkstoff für Kerne dazu, dass viel weniger Kupfer für einem gegebenen perzentualen Gleichstromverlust zur Anwndung gelangt. Im Bau grosser Wechselstromgeneratoren hat die Verwendung innengekühlter Kupferleiter zu keinerlei Korrosionserscheinungen geführt. Für den Bau elektrischer Geräte, die bei sehr tiefen Temperaturen in der Nähe des absoluten Nullpunktes arbeiten ist Kupfer besonders gut geeignet.

Steuerung eines Aluminium-Walzwerkes, II 635

Bei der Steuerung eines zum Heisswalzen von Aluminiumbarren eingesetzten Umkehrwaltzwerks mit automatisiertem Betrieb werden weitgehend magnetische Verstärker verwendet. Das Walzwerk wird von zwei Gleichstrommotoren von je 4000 PS angetrieben, die durch einen Ilgner-Satz gespeist werden. Dieser wird von einem Wechselstrommotor angetrieben, dessen Leistungsaufnahme durch Flüssigkeitswiderstand begrenzt wird. Der Antrieb der Hauptrollgänge erfolgt durch Gleichstrommotore, die durch Quecksilberdampfgleichrichter gespeist werden, sodass sie sich zur Nutzbremsung und Umschaltung eignen.

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2

Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

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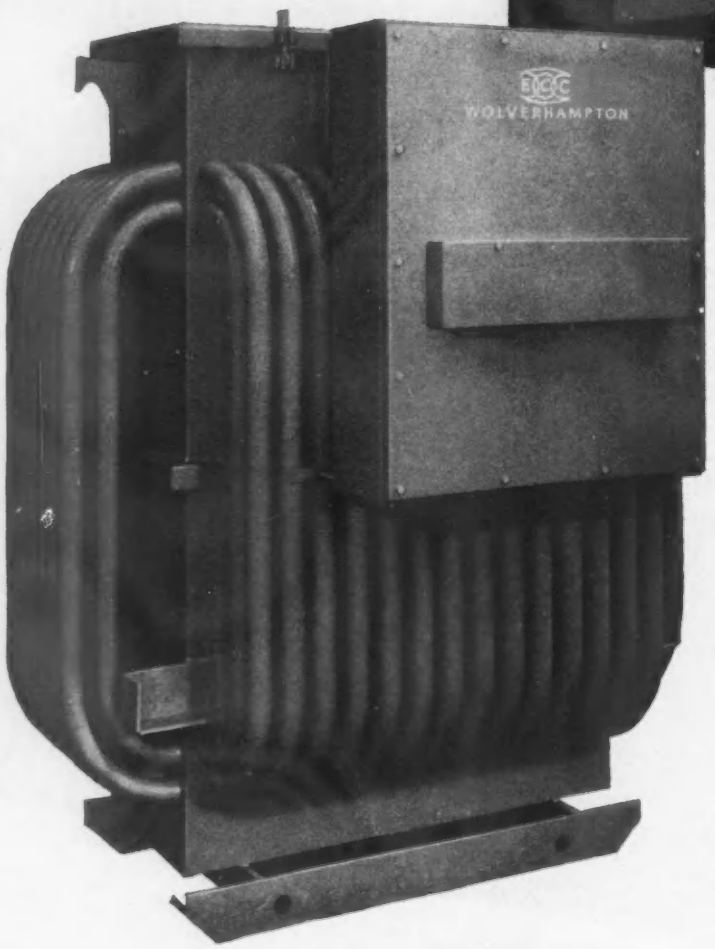
COMBINED TRANSFORMER AND LT SWITCHGEAR UNITS



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FOR USE WITH ANY APPROPRIATE TRANSFORMER

NO FLOOR SPACE FOR LT SWITCHGEAR

LOW INITIAL COST

SHORT CIRCUIT TESTED

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 27 OCTOBER, 1960

Editor and Managing Director:
ROY BALDWIN, M.I.E.E., Barrister-at-Law

Joint Editor:
K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

News Editor:
T. W. WRIGHT

Comment

INDUSTRY FORUM

By the end of this year, the Electrical Fair Trading Council will be dead, another casualty of the Restrictive Trade Practices Act. In its 24-year existence it has not only operated effectively as the guardian of orderly trading within the electrical industry, it has also provided common ground on which differing sections of the industry could meet. Within the next few weeks the question will be decided whether a new body should succeed EFTC as a forum for the industry. At present, manufacturers are on the whole against this idea; wholesalers and contractors for it. Urgency about a decision comes because the EFTC is unique as a whole-industry meeting point. It will be increasingly difficult to start a new representative organisation as memories of EFTC fade into the past. With all the uncertainties of trading that have been demonstrated over recent years, it seems to us wise to keep at hand some machinery for joint consultation and exchange of views between the different parts of the electrical industry. Sectional interests differ and must quite frequently clash, but there is superimposed a specifically "electrical" viewpoint which may need presenting to Government, to associations representing other trades and to various official bodies. Those who deprecate the idea of the new electrical forum point out truly enough that there will be little immediate business for it, and show some fear that it may come to make work for itself in the absence of finding some current task at hand. But it is to the unknown future that the idea of the forum looks, not to the immediate present with interlinking forces in the industry still at work. Individual trade associations who will be taking a decision on the forum idea in the next few weeks should at least agree to forming a committee to look more closely into the idea, rather than shy away because of its apparent difficulties and lack of immediate advantage.

ELECTRICAL EXPORTS AID

If export orders for heavy electrical plant are to be won, not only must the design be good and the price and delivery right, the credit terms offered to the customer must often be generous as well. That last detail has been a serious stumbling block in the face of continental competition backed by Government help for industry, for British financial institutions have stood firm against any suggestions that they should join in a credit race. Last week, however, some relaxation in one aspect of British practice was announced by the President of the Board of Trade. In future, the Export Credit Guarantee Department, the channel through which the Government backs British exporters, will be able to extend its cover for longer

than the five years maximum that has previously applied. The extension is hedged around with provisos, including the requirement that this shall only be done where contracts are commercially desirable, from a prestige or replacement market aspect, and where foreign competitors can be shown to have Government backing, too. It will apply on an exceptional basis, with each case to have separate consideration—a dangerous possibility of delay comes in here—but for all these shortcomings it will be welcomed by electrical manufacturers as an opportunity to compete more nearly on equal terms with continental manufacturers. They will welcome as well another change, whereby the ECGD arrangements can apply for the first five years of long-term credit in cases where exporters feel justified in carrying the risk for the extension period. ECGD rules have previously been too rigid to fit in with such an arrangement. In both cases, however, exporters are still left to find the finance. The extension of guarantees helps them do that; it does not ensure that they will succeed in the British market.

SYNTHETIC TESTING POSSIBILITIES

Full-power, short-circuit testing is a procedure so expensive in equipment that some cheaper way of obtaining the information it can give has long been sought. The principles that a substitute synthetic test have to satisfy are clearly enough defined. Fault current should be present at the magnitude which will be met by the gear under test when in use, and it has to be succeeded by a recovery voltage appropriate in magnitude and frequency characteristics. Although much progress has been made along these lines in the testing of circuit-breakers, there has been less attention to the synthetic testing of fuses. ERA work based on a Russian suggestion is described in our pages this week, and it has produced results which show that, at least for development work, synthetic testing using capacitors in an oscillatory circuit may have applications as an alternative to a short-circuit test alternator. However, for fuse work the synthetic testing in an oscillatory circuit cannot replace the full-power test in final proving. The mechanism of fuse operation, and especially sensitiveness to current asymmetry, does not fit in well with the possibilities of the synthetic test.

TALKING ABOUT I.E.E.

IEE members departed from their usual disinterest in the government of the Institution last year to produce a turbulent series of debates on alterations to the by-laws. Out of those events has come an honest attempt by the IEE Council to find what went wrong and how it could be set aright for the future. Last week, members received the report of the *ad hoc* committee which was charged by the Council with the task of looking into the contradictory mass of complaints and suggestions put forward during the by-laws debates. The IEE membership owes a considerable debt of gratitude to this hard-working committee—it worked through no less than 14 whole-day meetings—for the outspokenness of its report. Independent engineers most closely in touch with the affairs of the Institution can endorse the overall judgment that there is nothing basically wrong with the working of the IEE but that something has happened over the years to sour relationships between Council and the general body of members. "Communications" is the fashionable word for the phase of business that was unsatisfactory. The report now before the IEE membership deserves to be thought about carefully if members want to build up the liveliness of the Institution. Now that expression of individual views (which was always welcome, but sometimes difficult to effect) is to be made easier, members need to recognise that they are being given responsibility as well as opportunity. Probably the greatest satisfaction the *ad hoc* committee would receive would be occasioned by a more active and vociferous membership developing. The Institution is a power in the land today. Increased active interest by members can increase that power and its effectiveness.

ULTIMATE IN METER READING

Close attention currently being given to reduction of meter reading costs inevitably raises the question: How far away is the ultimate of fully centralised reading? Even if it is accepted that the integrating meter will have to remain part of the equipment at the consumer's premises, there seems no absolute technological bar to recording its indication at a central accounts office. The bar, of course, is economic. This question has been discussed recently in *Edison Electric Institute Bulletin*, association journal of the US private enterprise supply companies. Some 40 patents for providing central meter reading have been filed in the US but none of these is the complete answer. The technique most likely to achieve success, it is suggested, is a telephone line method with special equipment that can effectively interrogate the consumer's meter and obtain either an absolute reading of its registration or a figure showing consumption since the last check. The US estimate is that such a technique is approaching the area of economic acceptability at present, at least as a long-term hedge against rising costs of meter reading by peripatetic employees; and with some 90% of domestic electricity consumers in the US connected to the telephone system, the special-purpose wire-running is likely to be small. In this country, a much smaller proportion of domestic premises are on the telephone, so on that count alone centralised reading must be further away. Yet it is a technique that should begin to receive attention, for it accords well with the tide of mechanisation coming into consumer billing, and offers the opportunity of obtaining more accurate information on consumers' load characteristics.

Meteor

This week's quick summary of electrical news faces advertisement page 8

Synthetic tests on fuse links

POSSIBILITIES OF USING AN OSCILLATION CIRCUIT

by H. W. Baxter,* B.Sc., M.I.E.E.

SYNTHETIC testing, by means of which the breaking capacity of a circuit-breaking device can be predicted from tests using a source of lower power than would otherwise be required, has been a subject of investigation for some years for the testing of certain types of circuit-breaker. It was suggested because the large amounts of power that would otherwise be required were tending to become prohibitive, but it is not yet generally adopted because full agreement has not been reached on the method. It offers financial advantages, since the equipment can be less costly than an alternator.

Synthetic testing has not hitherto been much used for the proving of fuses because power adequate for this has usually been available, but a circuit has been described by Kaplan and Nashatyr† which is claimed to be suitable for the testing of h.v. fuses and to have certain economic advantages. Preliminary comparative tests have been made using this circuit and the results are compared with those obtained using the 10,000 kVA alternator installed at the Electrical Research Association's laboratory.

Kaplan and Nashatyr Circuit

If the pre-arcing time of a fuse is short in comparison with the time of a half cycle, the conditions obtaining in a power-frequency circuit can be simulated in an oscillation circuit of higher frequency.

The rate of rise of a sinusoidal current is $I_{max}\,\omega\cos\omega t$, which at time $t=0$ is $I_{max}\,\omega$. If the oscillation circuit rate of rise of current is $I_{1\,max}\,\omega_1$ and that in the power frequency circuit is $I_{2\,max}\,\omega_2$ then, for the two rates of rise of current to be substantially the same, $I_{1\,max}\,\omega_1 = I_{2\,max}\,\omega_2$. The prospective current can thus be reduced as the frequency of the oscillation circuit is increased; but the frequency cannot be increased significantly unless the fuse melts rapidly, so that the current during the pre-arcing period is substantially the same as it would be in a 50 c/s circuit.

The circuit which, it is claimed, is suitable for testing a device with a large voltage drop, such as a fuse, is shown in Fig. 1. Two circuits are described which are said to be of equivalent "economic efficiency." The one in Fig. 1(a), with current division, is recommended when the capacitor is charged to the voltage rating (peak) of the fuse. The circuit in Fig. 1(b), with voltage division, requires fewer capacitors but charged to a higher voltage than the voltage rating of the fuse. The latter circuit is the one that was used for the comparative tests described in this article.

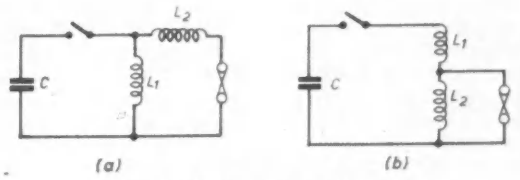

Fig. 1. Oscillation circuits for fuse testing

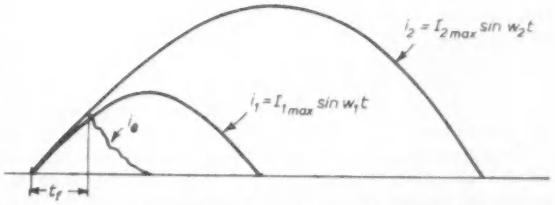

Fig. 2. Diagram illustrating approximate equivalence of pre-arcing currents in circuits of different frequencies and prospective currents when the pre-arcing time t_f is short

The circuit consists of two inductors L_1 and L_2 in series, with the fuse to be tested connected across L_2. When the circuit is connected to the charged capacitor C the frequency of oscillation is determined by the values of C and L_1 since L_2 is short-circuited by the fuse. When the fuse element has disrupted, L_1 and L_2 are in series and the frequency of the circuit is then lower and can be made equal to the normal power frequency of 50 c/s. The power-frequency current that would be applied to the fuse in a conventional test is represented by i_2 in Fig. 2. The higher-frequency current is represented by i_1 and in this instance it is shown as of twice the frequency and half the amplitude of i_2, so that the initial rate of rise of current after a current zero is identical in each case; i_1 represents an oscillogram of a fuse with significant cut-off and if the pre-arcing time t_f is sufficiently short the two currents i_1 and i_2 may be considered as practically equivalent. When the element has disrupted, the voltage applied to it is that appearing across L_2. If the components are suitably chosen this can be of normal power frequency (50 c/s) and of magnitude equal to the voltage rating of the fuse.

Test Results

Comparative tests were made using commercial 6·6 kV potential transformer fuse links of ½ A nominal rating. Three were tested in the alternator circuit shown in Fig. 3(a) and three were tested in the oscillation circuit of Fig. 3(b).

The alternator circuit was adjusted to give a prospective symmetrical current of 1,000 A r.m.s. at a power factor of approximately 0·1. This gave an initial rate of rise of current of 443,000 A/sec.

The initial frequency of the oscillation circuit was approximately 85 c/s and the initial rate of rise of current

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* This article is based on ERA report G/T321: "Comparative Tests of H.V. Fuse Links in an Oscillation Circuit and with an Alternator." Mr Baxter is with the Electrical Research Association.

† V. V. Kaplan and V. M. Nashatyr: "Testing of Current-Limiting H.V. Fuses in an Oscillation Circuit," Elektrichestvo, No. 5, 1956, pp. 38-42.

with the capacitor charged to 14·6 kV was $14{\cdot}6/32\times10^6$ or 450,000 A/sec. The prospective current in the capacitor circuit was approximately 600 A r.m.s. and the energy stored in the capacitors was about 12,000 joules. This corresponds to a charge of 1·66 coulombs.

The final frequency, with L_1 and L_2 in series, was approximately 50 c/s and the peak voltage across L_2 if negligible energy were taken from the capacitor would be $64\times14{\cdot}6/(32+64)$ or 9·7 kV (6·8 kV r.m.s.). The oscillation circuit thus simulates the alternator circuit provided that the pre-arcing time is short and that a negligible amount of energy is taken from the capacitor during the operation of the fuse.

Representative oscillograms of fuse links that operated satisfactorily are shown in Fig. 4. There were small variations in repeat tests, but the oscillograms did not depart seriously from those shown. It will be seen that comparable results were obtained in the two circuits. The arc energy tended to be slightly lower in the oscillation circuit and the recovery voltage was also lower (about 15% to 20% lower), owing to the energy taken from the capacitor, which was about 2 kW sec. On the other hand, the voltage across the fuse at current extinction, appeared to be higher in the oscillation circuit, an average of about 3·5 kV as compared with 1·3 kV in the alternator circuit. The pre-arcing time under these conditions was less than 0·5 msec and the cut-off current was about 100 A. The arcing time was about ten times the pre-arcing time.

Comparative tests were also made using fuses that failed in the alternator circuit to see if they would also fail in the oscillation circuit. The cartridges were of the same physical dimensions as those used in the earlier tests, but the length of the element was reduced.

The oscillogram of the fuse link tested in the alternator circuit* is shown in Fig. 5 (a). There was insignificant current-limiting effect, practically the full value of the prospective current being reached and the circuit was cleared by the back-up circuit-breaker. The fuse link shattered.

Four fuse links were then tested in the oscillation circuit.† Two arced for one half cycle and liberated about 5 kW sec of arc energy. In the remaining two tests arcing lasted for two half cycles and the arc energy reached approximately 12 kW sec. Arcing could not persist because the capacitor was practically discharged. There was no violent shattering, as in the tests with the alternator, but the cartridge of one of the fuse links cracked. Typical oscillograms are shown in Figs. 5 (b) and (c).

Reduced Prospective Current Test

BS 88: 1952 (Electric fuses for voltages up to 660 V) and BS 2692: 1956 (fuses for a.c. circuits above 660 V) specify a test under conditions of maximum inductive energy, the prospective current for which may have to be below the maximum breaking capacity. The conditions for this test are such that the pre-arcing time is almost a quarter cycle, and there may be virtually no cut-off. Such a test cannot, therefore, be simulated in the oscillation circuit, because of the serious departure from linearity of the rise of current.

A simple series arrangement of inductance and capacitance can be used to obtain a 50 c/s current, but the stored energy would be small. For the fuse links tested, the maximum inductive energy corresponds to a prospective current of about 30 A. At 6·6 kV the circuit impedance would be about 200 ohms (L=0·6H) and the capacitance to tune to 50 c/s about 15 μF. The stored energy at $\sqrt{2}\times6{\cdot}6$ kV is roughly 0·75 kW sec, the corresponding charge being 0·15 joules. The energy liberated in the fuse link during the first half cycle would probably be about one half the initial energy in the capacitor; the recovery voltage would, therefore, probably be so small as to invalidate the test.

Since the reduced-prospective-current test requires less power the advantage of the oscillation circuit is not then so great.

Interpretation of Results

Since the energy available is small compared with that obtainable from an alternator, failure of a fuse to interrupt the oscillation circuit may not be accompanied by explosive violence. Some other criterion of failure is, therefore, necessary.

In a well-designed fuse the cut-off current is not exceeded and, in fact, the current thereafter is usually less than the cut-off value. If the current continues to increase after cut-off, as in Figs. 5 (b) and (c), the fuse may be considered to have failed, and it would probably be destroyed if tested in a power circuit.

A reduction of the current after cut-off, as in Fig. 4(a), might be regarded as a successful clearance, more especially if the arc extinguishes at the first current zero, provided that the recovery voltage is not seriously reduced. In this particular test the recovery voltage was 5·1 kV, a reduction of nearly 23% from the nominal value of 6·6 kV. The required value could be obtained by re-calculating the circuit, but this would increase the voltage during arcing and so increase the arc energy beyond what it would be in the alternator circuit. When the arc duration is short and the pre-arcing energy small, it is unlikely that any major modification to the oscillation circuit would be required.

Advantages and Drawbacks

The main attraction of the oscillation circuit is its simplicity and low cost. The capacitors used in these tests cost about £1,000. The cost of the charging equipment depends on the charging rate but would probably not exceed £250. A machine of, say, 10% reactance to give the equivalent prospective current (1,000 A) would be of about 1,000 kVA capacity, and with its driving motor and associated equipment would cost several thousand pounds.

The maintenance and running costs of the oscillation circuit are smaller than those of an alternator. Against this must be set the fact that its scope is more limited, since it is confined to tests in which melting occurs in a small fraction of a half cycle and in which the arc energy is small in comparison with the initial energy in the capacitor.

The main technical drawbacks of the oscillation circuit are:

1. It is more troublesome to adjust than an alternator circuit because C, L_1, L_2 and V_0 must be correctly chosen to give the desired rate of rise of current and recovery voltage. Allowance may also have to be made for the loss of charge from the capacitor during the operation of the fuse.
2. It furnishes a symmetrical current. The effects of current asymmetry could probably be simulated, although this is an additional complication.
3. The liberation of a large amount of arc energy may discharge the capacitor to such an extent as seriously to reduce the recovery voltage.

* Only Duddell oscillographs were available for these tests.

† The voltage rating is 15 kV (d.c.), intermittent operation.

Conclusions

The main conclusions are:

1. The oscillation circuit is practically equivalent to an alternator circuit when testing fuses that operate quickly with a small cut-off current and small liberation of energy and it could probably be usefully employed as a substitute for an alternator during the development stage.

2. The energy avaliable from the oscillation circuit is small in comparison with that available from an alternator. A large liberation of arc energy may, therefore, cause a significant reduction of recovery voltage.

3. Asymmetrical currents cannot be obtained with an oscillation circuit.

4. The reduced-prospective-current test corresponding to maximum inductive-energy cannot be simulated in the oscillation circuit because of the long pre-arcing time and departure from linearity of the rise of current.

5. The oscillation circuit is cheaper to install, run and maintain than an alternator, but has a smaller power output and cannot be regarded as a substitute for an alternator for all breaking-capacity proving tests.

APPENDIX

Calculation of values of C, L_1, L_2 and V_c (Fig. 1 (b)).

f_1 = initial frequency.
f_2 = frequency of recovery voltage (50 c/s).
V_c = voltage to which C is charged.
V_f = voltage (r.m.s.) rating of fuse.
I = prospective current (r.m.s) at frequency f_2.

$$\frac{\sqrt{2}\,V_f}{V_c} = \frac{L_2}{L_1 + L_2} \quad \ldots\ldots\ (1)$$

$$\left(\frac{\omega_1}{\omega_2}\right)^2 = \frac{L_1 + L_2}{L_1} = \gamma^2 \quad \ldots\ldots\ (2)$$

$$\frac{V_c}{L_1} = \frac{di}{dt} = \sqrt{2}\,\omega_2 I \quad \ldots\ldots\ (3)$$

$$\omega_2 = \frac{1}{\sqrt{C(L_1 + L_2)}} \quad \ldots\ldots\ (4)$$

From which

$$C = \frac{I\,(\gamma^2 - 1)}{\omega_2\,V_f\,\gamma^4}$$

$$L_1 = \frac{V_f\,\gamma^2}{\omega_2 I\,(\gamma^2 - 1)}$$

$$L_2 = \frac{V_f\,\gamma^2}{\omega_2 I}$$

$$V_c = \frac{\sqrt{2}\,V_f\,\gamma^2}{\gamma^2 - 1}$$

Choice of ω_1—Considering first a 50 c/s current of I amperes r.m.s prospective value, the initial rate of rise di/dt is 314 $\sqrt{2}$ I. If the pre-arcing time of the fuse were 1 msec the cut-off current would be 0·309 $\sqrt{2}$ I. If the current rose linearly at the rate of 314 $\sqrt{2}$ I A/sec the value after 1 msec would be 0·314 $\sqrt{2}$ I. The difference, being less than 2%, is insignificant. It, therefore, seems that the pre-arcing should preferably not exceed one msec if an oscillation circuit is to be used. In general, the frequency f_1 should not be higher than:

$$\frac{50 \times 0{\cdot}309\ \sqrt{2}\ \text{prospective 50 c/s r.m.s. current}}{\text{cut-off current}}$$

or say:

$$22\ \text{I/(cut-off current)}$$

In setting the oscillation circuit it is essential to know the cut-off current at the chosen 50 c/s prospective current. This can be calculated from information given in ERA report Ref. G/T246.‡

The appropriate frequency ω_1 may then be determined, after which the values of L_1, L_2, C and V_c may be calculated.

‡ Calculated Curves of Inductive Energy at the Start of Arcing in Fuses. By H. W. Baxter.

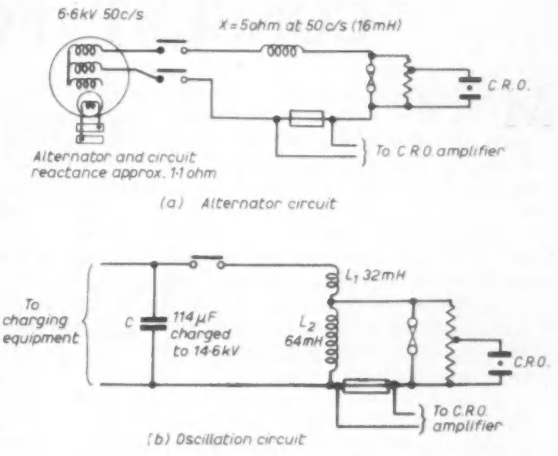


Fig. 3. Constants of (a) alternator circuits, and (b) oscillation circuit used in tests

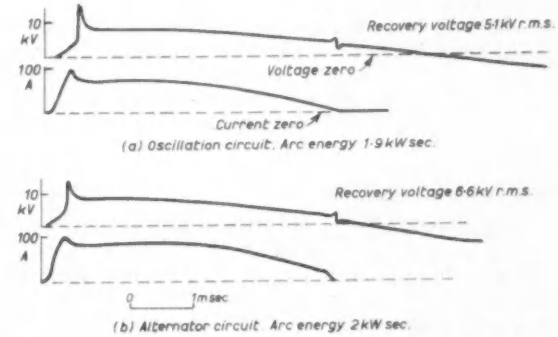


Fig. 4. Representative oscillograms taken in circuits (a) and (b) of Fig. 3

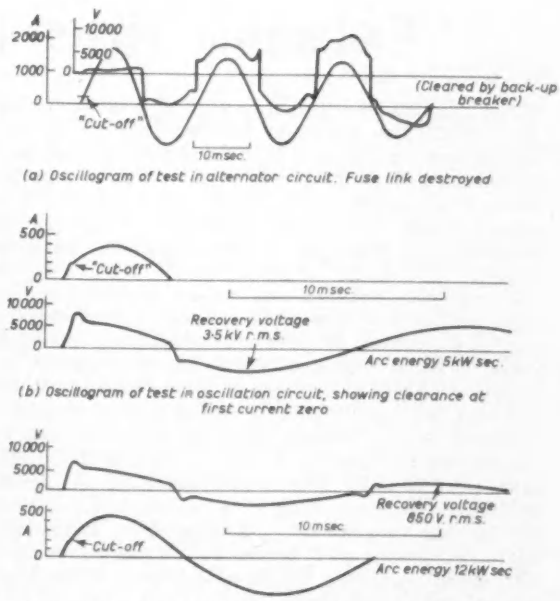


Fig. 5. Results of various tests

CONSENT FOR OLDBURY

MINISTERIAL consent for construction of the CEGB's 550 MW nuclear power station at Oldbury-on-Severn, Gloucestershire, was announced last week. The site lies on the south-east bank of the Severn Estuary, 14 miles north of Bristol and 4½ miles downstream from Berkeley power station. The new station is programmed for completion in 1966, and the official CEGB view is that this target date will still be possible "despite the long delay in obtaining consent." Application for the consent was made to the Minister in April, 1959, but it was not until April, 1960, that a public inquiry was held.

Ministry of Power and Ministry of Housing and Local Government inspectors who conducted the public inquiry concluded that, although construction of a power station at Oldbury would inevitably do damage to an attractive landscape, the loss would not be grave enough to justify refusing or deferring consent to the station. Both inspectors concluded that the technical advantages of the site outweighed the loss of agricultural land. However, the MoH and LG inspector added that he found a possible multiplication of power stations on this section of the Severn disturbing. The Minister of Housing has indicated that he is considering the general position in the Severn Estuary "in the light of future industrial needs, including the possibility that the CEGB may wish to develop the other sites now under investigation, in order to guard against the risk of haphazard developments in this area."

Technical Features

Technical features of the Oldbury site and the nuclear station planned for it are set out in the inspectors' report, made available to interested parties. Oldbury is considered strategically placed to meet loads in central southern England, which is the most difficult to supply economically of the whole CEGB area. A station there would help supply the growing demands of Bristol and its suburbs, and meet the night loads in South Wales, which are considerably above the national average because of the heavy concentration of industry.

Cooling water supplies at Oldbury are virtually unlimited, except at the lowest part of the tidal range. Advantage is to be taken of a rock shelf off-shore to create an artificial tidal reservoir, from which cooling water can be drawn at low tide periods. (Ministry of Transport consent for this is promised.) The reservoir will be 350 acres in extent. Cooling water requirements for a 550 MW station are estimated at 30 million gallons/hour. Foundation conditions at Oldbury are good, and it is anticipated that the station can be built using a comparatively simple and relatively cheap form of raft foundation.

1,550 MW Future?

Although a 550 MW station is the subject of the consent, the Board is anticipating a second station, possibly of 1,000 MW capacity, at a later date. This second station might be a more advanced design than the first, which will be of the gas-cooled graphite-moderated natural-uranium fuel type. The initial station will have two reactors, a turbine house and a switch house.

Transmission from Oldbury will be over the existing Melksham-Uskmouth 275 kV double circuit line which will be looped into the station switchgear; and by a new 275 kV double circuit line running south from the station to connect into the grid system in the Bristol direction. No new lines will run north from Oldbury.

Oldbury is the seventh nuclear station for which the CEGB have received assent. Tenders for construction of the sixth station, at Sizewell, are currently being examined.

Columbia River project to go ahead

THE simultaneous announcement in Washington and Ottawa that agreement has been reached between Canada and the US for the co-operative development of the Columbia River marks yet one more stage in a project which may rival the St. Lawrence Seaway before it is complete. The scheme to harness the waters of the Columbia and Kootenay, together with their lakes, on Canadian territory for the mutual benefit of both countries has long been discussed and, indeed, in Columbia has been considered of such significance as to merit inclusion in discussion groups of the schools from Grade 5 upwards. Some of the points have given rise to acrimony, for Canada is jealous of its rights in Columbian River waters and there has been the point of view that all of the current generated in the Canadian territory should be used for Canada and not exported. Engineers from both countries have taken a more liberal view and have co-operated wholeheartedly in surveying the areas and have presented, through the International Columbia River Engineering Board, three plans, each incorporating a number of dams, with estimates of costs for the consideration of the International Joint Commission.

The first of these is for 11 dams at Libby and Kootenay Falls in the US on the Kootenay River, Bull River junction, Mica, Downie Creek, Revelstoke Canyon, Duncan Lake, High Arrow, Murphy Creek, Low Arrow and Kootenay in Canada. The second includes a dam at Copper Creek and diversion of the waters of Kootenay to the Columbia, which are only a mile apart at this point. The third is for a dam at Dorr, forcing the flow of the Kootenay back into Kootenay Lake. There is no indication which of the plans has been adopted but the mention of the initial sums involved, $450 million, would seem to indicate that this is for the construction of a dam at High Arrow and, possibly, Mica, by Canadian engineers, while the US is believed to have been granted permission to go ahead with the Libby dam in Montana.

The total cost of the schemes was estimated, at 1957 levels, to range from $3,560 million to $3,880 million. Even at this stage there is some uncertainty as to how these large sums will be raised but, such is the prestige of hydro-electric projects these days, a way is sure to be found, particularly since the projects are estimated to boost power output from the Columbia by 9,000 MW.

Meanwhile, it would appear to many that the alternative scheme for harnessing the Peace River has been shelved, at least for the present.

Outlook for copper

ELECTRICAL FUTURE SEEMS ASSURED

USE of copper in the heavy electrical industry may reasonably be expected to increase, commensurate with the expansion of production to be anticipated in the future. Only a drastic, and at present unpredictable, change in the price of copper or its rival materials is likely to alter this conclusion. Copper remains in many respects the most suitable material for large electrical machines and its convenience for electro deposition is one reason for its importance to the electronics industry because it enables the intricately shaped and accurately dimensioned radar components to be constructed.

These conclusions sum up the symposium on recent developments in the use of copper for the electrical industry held at the Dorchester Hotel last week under the chairmanship of the Earl of Verulam, managing director of Enfield Rolling Mills.

The four papers discussed dealt with the economic use of copper in large transformers, internally cooled copper conductors, copper as a material for waveguide construction and some applications of copper alloys.

Transformer Economics

The economic use of copper in power transformers was outlined by Mr F. W. Gee (Ferranti). His paper was concerned with predicting probable consumption of copper in the next ten years on the basis of past trends. Although, in comparing different designs of a given transformer, the aim must always be to find the design giving the lowest cost, criteria must be selected to take into account other major factors such as the permissible losses. A useful guide was to plot the ratio of kVA per lb of copper to percentage full load loss, against the transformer MVA rating. Such a graph revealed the importance of the cold rolled steels used in recent years for reducing the amount of active copper. For example, utilisation of copper had increased by 20% for a 40 MVA transformer, while for a 100 MVA unit it had risen 40%.

Stray losses, which might amount to 25% of the direct load losses and might sometimes even exceed direct I^2R losses could be reduced by using continuously transposed, stranded conductors. Such conductors, which were stranded on a special machine, might have as many as 27 lightly insulated strands in parallel. This technique could reduce the stray loss by 10 to 20%. Use of super purity copper in very strong leakage fields might result in an increase in stray losses. This objection could be overcome by using higher resistance alloy coppers which also had the advantage of higher tensile strength to meet the considerable mechanical forces which may occur in large transformers.

Marginal improvements might be attained with new insulating materials and for small transformers, foil windings had possibilities since they had only the volts per turn between layers and the series capacitance was high, giving a linear surge voltage distribution. However, the limitations are likely to be in the foil dimensions and in reliability of insulation.

Copper consumption for transformers was likely to have risen by 40% to 50% by 1970 given certain assumptions, of which the most important were that no further radical improvement in core material could be expected and that there would be no major changes in the prices of either copper or core steel.

Cooling Conductors

In the second paper, Messrs Cogle, Hartill and Tudge (AEI Ltd., Manchester) outlined some applications of liquid-cooled conductors to such diverse products as turbo-alternators and thermo-nuclear devices.

Conductor cooling by liquid and gas had enabled the weight of active material and floor space requirements of turbo-alternators to be reduced to about 30% of machines built 12 years ago. Mr Tudge referred to the Bold 30 MVA turbo-alternator which had been in service since 1956. The machine had a stator winding, cooled by circulation of turbine condensate through hollow copper conductors. The rectangular conductors were drawn from electrolytic copper tube to close tolerances and then formed into transposed windings. Special hydraulic joints were developed to prevent leakage, using p.t.f.e. links for the water circuit. Rotors in use were cooled by hydrogen, circulated either by fans or by scoops arranged along the rotor length. Here also close tolerances were necessary on the conductors and use of a 0·07% silver copper had assisted in preventing winding deformation in use.

Water cooling has also been used for turbo-alternator terminals and links to the windings. The authors suggested that the next logical step would be to water cool connections between the alternator and generator transformer.

Two applications of water cooling for transformers were described in the paper. Both were welding transformers, with single-turn secondaries, one operating at 50 c/s and the other rated 230 kVA 450/42 V 10 kc/s. Water, circulated through hollow primary windings, also removed heat from the closely positioned secondary sheet conductor. Conventional power transformers were unsuitable for water cooling in the authors' opinion because the long length of conductor required prohibitively high water presssures to ensure adequate circulation. However, provided copper hollow conductors could be manufactured in sufficiently long lengths, water cooling was feasible for generator transformer windings rated 11 kV and below.

The paper also described use of water cooled conductors for the Glasgow synchrotron and other research applications and concluded by referring to the future possibility of cooling by liquid gases. At the low temperatures of such gases as hydrogen and helium, the superconductive properties of copper would permit greater power output per unit weight.

The paper by Messrs Hall and Meggs (AEI Ltd., Leicester) dealt with uses of copper for manufacturing radar waveguides. The authors outlined the electroforming process for producing accurately dimensioned components and referred to some of the inherent difficulties of the process.

Copper Alloys

In the final paper, Mr T. L. Richards (CDA) outlined some of the properties of copper and copper alloys available for use by the electrical industry. Annual requirements of the British electrical industry were about 300,000 tons, mostly in the form of high conductivity copper.

The three grades of high conductivity copper available had only minor differences in their principal mechanical properties and electrical conductivity. Certain of their mechanical properties, however, rendered them suitable for particular applications. Electrolytic-coppers were preferred for enamel wires because they tended to soften more readily at elevated temperatures after work hardening than fire-refined coppers. This enabled annealing of wires to be performed at the same time as enamelling. On the other hand, fire-refined copper had greater resistance to softening during soldering and it was, therefore, often preferred by commutator manufacturers. The third grade, oxygen-free copper, was imported from the USA. Its freedom from embrittlement after brazing was an advantage for the construction of rotors for squirrel-cage induction motors. It was also widely used in the electronic valve industry.

Of the many alloys available, an alloy with addition of 0·08% silver raised the softening temperature by between 100°C and 150°C, an advantage for commutator construction. Its use had also eliminated rotor failures due to copper shortening on turbo-alternators. Cadmium copper, with about 1% cadmium, had similar resistance to softening as silver copper and its high resistance to wear suited it particularly for overhead line equipment on power systems or railways' catenaries.

Chromium copper had been used for end rings and rotor bars on squirrel-cage rotors operating under severe stress at high temperatures. For switchgear parts and contacts it had the advantages that strength was improved by cold-working, while prolonged exposure at temperatures up to 350°C had little effect on its mechanical properties. A new alloy developed as a commutator material for aircraft equipment was zirconium copper. This was an age-hardenable alloy with properties similar to chromium copper but with the advantage of having its mechanical strength much less influenced by the direction of rolling. It was also appreciably stronger when notched like commutator segments.

Discussion

Presentation of the papers was followed by a lively discussion centred around transformers and the problems of electro-forming. The very high accuracy and surface finish essential for the internal surfaces of wave-guides had required development of electro-plating techniques which were considerably more refined than had been previously necessary.

In opening the discussion, Mr M. Waters (ERA) referred to a current programme of research into the properties of copper being undertaken by ERA. It was surprising how little was known about the mechanical properties of copper. It now seemed that differences in performance of transformers under hoop stress was due to the amount of initial cold-working the copper received during winding rather than to the presence of impurities. A paper presented at the 1960 CIGRE by Christoffel suggested that the strength of copper was maintained under sudden mechanical stresses such as occur on short-circuit. However, tests at ERA implied that his conclusions could have resulted from a different work-hardening history of the specimens tested. It had also been shown, by examining windings of a transformer which had been in service for a number of years, that, contrary to the usual opinion, copper did not soften in service.

Referring to the effects of cold-working, Mr E. C. Mantle (British Non-Ferrous Metals Association) said tests had shown no evidence of softening after 12 to 18 months at 150°C with a 3% to 5% cold-worked copper. Cycling tests made to simulate short-circuit conditions in transformers had also shown no evidence of softening. Typical tests consisted of raising the specimen temperature to 250° for ten seconds, allowing it to cool to 150°C for five minutes and repeating for ten or more cycles.

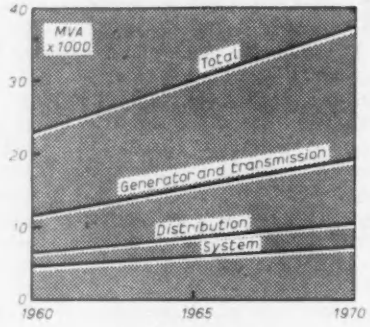


Fig. 1. Estimated growth of the transformer market over the next ten years

The question of corrosion in water-cooled systems was raised by Mr P. McKenna (BICC) who referred to trouble experienced with furnace connections owing to the water supply being interrupted when the furnace was shut down. The solution seemed to be either to maintain water flow or to thoroughly flush out the system. He asked if trouble had been experienced with corrosion in the turbo-alternator installation referred to in the paper.

In reply, Mr Hartill said no evidence of corrosion had been obtained on the Bold machine, but it should be borne in mind that the water was of very high purity. In the case of the Glasgow synchrotron there was evidence of some deposit, but it was not attributable to copper corrosion. Cables in the synchrotron consisted of stranded enamelled conductors wound on a copper tube through which flowed water from the town supply. No recirculation was provided.

The subject of corrosion was also pursued by Mr D. E. Bird (Ewbank and Ptrs) who asked if special means had been taken to removed dissolved oxygen from the turbo-alternator cooling supply. Again, Mr Hartill reported that no special precautions had been necessary. He did add, however, that if Hydrazine, Morpholine or similar chemicals were added in the water treatment plant, they would have to be removed by a demineraliser before circulation through the copper conductors to avoid corrosion.

Mr S. A. Clarke (CEGB Southern Project Group) asked why it was not possible to mount the generator transformer much closer to the alternator and so reduce the length of linking busbar.

Some information on the properties of zirconium copper, particularly for aircraft commutators, was given by Mr R. W. Shapton (Rotax). He said that zirconium copper was the nearest approach to the ideal commutator material yet produced and it seemed likely that its use for commutators would eventually become standard. Zirconium copper was better than chromium copper for temperatures above 200°C, and its creep resistance was very much better than either chromium or silver copper.

The proceedings of the symposium are to be published by the Copper Development Association.

Hot reversing mill for aluminium—part 2

by D. W. Prowse,* B.Sc., A.M.I.E.E.

AS indicated in the previous article*, AEI were contracted to supply the whole of the electrical equipment for the new four-high hot reversing mill for Alcan Industries Ltd. (formerly Northern Aluminium Co. Ltd.), at their Rogerstone Works.

The electrical equipment was designed to drive and control all operations on the ingot from leaving the ingot pre-heat furnaces, through the rolling process, to the shear where the piece is cut up to the required length. It is then either passed on to the 96 in. mill for further rolling and coiling or is removed as a completed plate.

In this extensive installation AEI were able to achieve a large amount of standardisation.

Among the many advantages of standardisation two important ones are:

(a) Reduction in the number of different components with consequent economy in the number of spares.
(b) Reduction in the number of different systems enabling the comprehensive scheme to be more readily understood by maintenance personnel.

For example, the a.c. auxiliaries were designed in close collaboration with the mechanical manufacturers Davy and United Engineering Co. Ltd. so that similar standard schemes could be used for the electrical and mechanical lubrication systems.

The d.c. control schemes and the closed loop regulators were designed so that the same magnestat pre-amplifier could be used throughout, with two sizes of second stage magnestats for the various types of control. The same magnestats were also used for the hot coiler controls for the finishing mill.

The various drives are: main drive; feed rolls; main tables; turntables; screwdowns; shear; roll change rig; solenoid controls for mill side-guides, down tilter, etc.

Main Drive

Mill Motor Control. The main mill drive consists of two 4,000 h.p. 30/60 r.p.m. motors, each driving individual rolls of the reversing mill. The top and bottom roll motors are each controlled by two generators connected in series in two separate Ward-Leonard loops as shown in Fig. 1. The motors are controlled up to base speed (30 r.p.m.) by variation of generator output voltage with constant motor field, and from 30 to 60 r.p.m. by variation of the motor field current with constant full armature voltage.

The fields of all four generators are supplied by one exciter controlled by an amplidyne. The generator fields are connected in series-parallel, so that the armature currents of the top and bottom roll motors can be controlled independently for load balancing.

The mill operator is seated at a desk in the mill pulpit and controls the mill rolls by means of a hand-operated

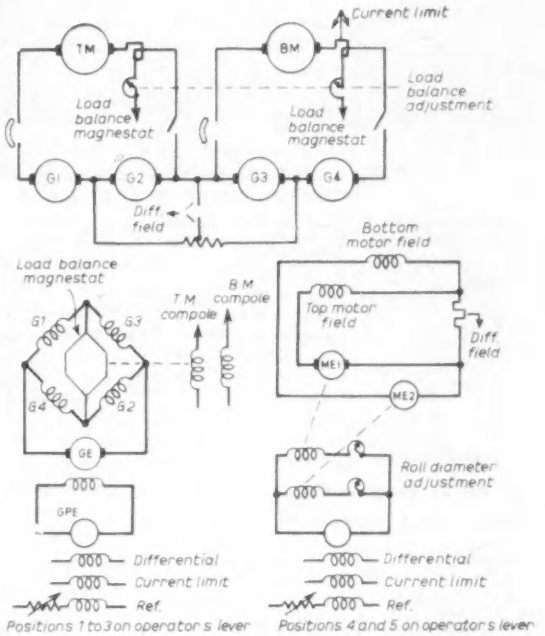


Fig. 1. Schematic diagram of twin-drive control system. M, motor; G, generator; E, exciter, etc.

master controller with five positions forward and reverse. The first three positions of the controller increase the output of the amplidyne controlling the generator exciter, and with the controller in the third position the generator output voltages will be at a maximum value and the motors will run at base speed (30 r.p.m.).

The mill motors have identical field exciters, duplicates of the generator exciter, which are controlled by a common amplidyne. Moving the controller past the base speed position reduces the reference signal to the amplidyne, causing the motor exciters to weaken the motor fields, and the motor speed is thereby increased in the range 30 to 60 r.p.m.

The roll diameter adjustment rheostat enables different values of current in the motor fields to be controlled by a common signal. When the rolls are of different diameters the motors can be set to run at different speeds, so that equal roll peripheral speed may be obtained.

The mill motors are mechanically coupled only when there is metal between the rolls. During rolling the peripheral speed of the rolls will be the same and with rolls of equal diameter the speeds of the motors will also be the same. A load balance magnestat is used to control the load taken by the motors by superimposing a signal in the generator field circuit, adjusting the generator voltages so that the correct load ratio is obtained. By controlling the generator fields rather than the motor fields

* Mr Prowse is with Heavy Plant Division, AEI Ltd. Pt. 1 of this article, by Mr G. H. Sutton, appeared on 13 October, p. 547.

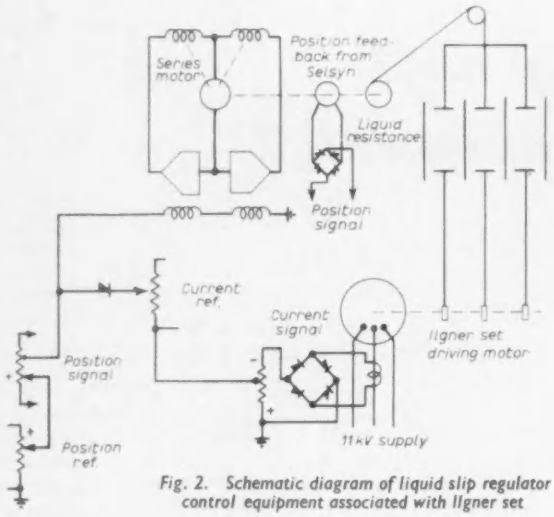


Fig. 2. Schematic diagram of liquid slip regulator control equipment associated with Ilgner set

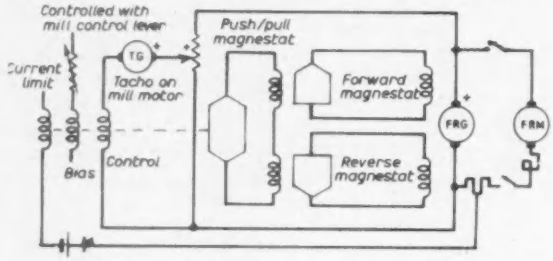


Fig. 3. Schematic diagram for feed roll control scheme

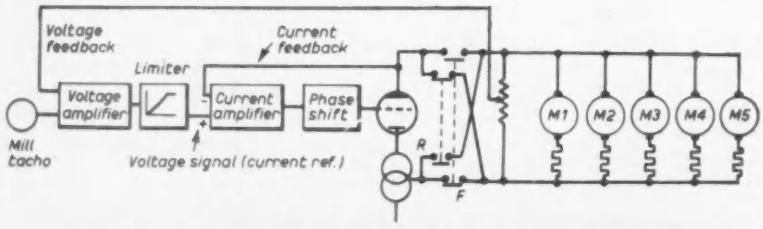
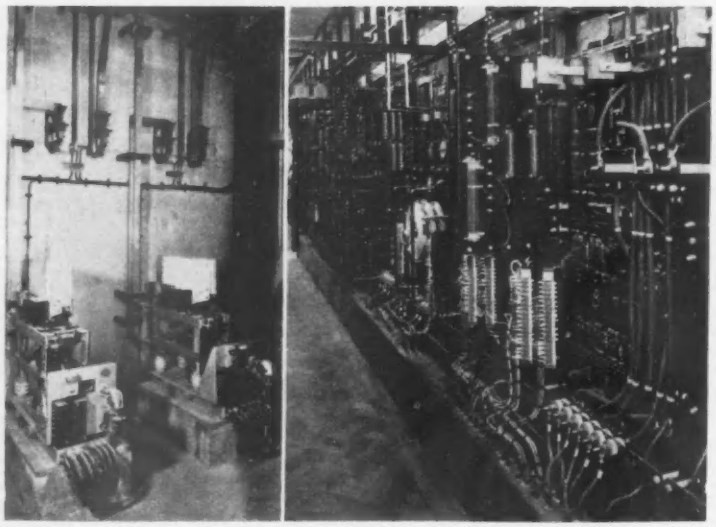


Fig. 4. Schematic diagram for control of main tables; see Fig 8 for further detail



Figs. 5 and 6. Left, Fig. 5, high-speed circuit-breakers and wall-mounted isolators for converters associated with main tables. Right, Fig. 6, back of one of the main control panels

a better response is obtained and optimum motor torque is available. The load balance rheostat permits the armature currents, and therefore the motor torques, to be unbalanced by a controlled amount to improve rolling.

Ilgner Set Control. The generators supplying the mill motors are part of a flywheel motor generator set driven by an 8,000 h.p. induction motor. The flywheel stored energy is used to smooth out the rolling peaks on the supply system. When load on the Ilgner set driving motor rises to more than 1·5 times full load, resistance is inserted in the rotor circuit of the motor causing it to slow down so that energy is released by the flywheel. After the peak rolling is past the set accelerates again and the flywheel stored energy is replaced.

The electrodes of the liquid slip regulator are driven by a small pilot motor which is controlled by a magnetic amplifier position servo, with overriding stator current control. The control scheme is shown in Fig. 2.

To start the Ilgner set the automatic control system puts on a position reference for minimum rotor resistance. The electrodes move quickly to the position required to obtain approximately one and a half times full-load current. At this position the current feedback exceeds the current reference and the "spill-over" signal opposes the position error to arrest the electrodes. As the Ilgner set accelerates, the electrodes are moved in to keep the accelerating current constant.

During rolling, whenever the peak current demanded from the supply exceeds the current reference of one and a half times full-load current, the electrodes are moved out to increase rotor resistance, limiting the supply current, the necessary energy being made up from that stored in the flywheel.

Feed Rolls

The feed rolls, situated each side of the main rolls, feed the material into the mill. They are individually driven by direct-coupled mill-type motors. The feed rolls are controlled to run at the same peripheral speed as the main mill rolls and the control system for one set is shown schematically in Fig. 3.

The main reference is taken from a tacho-generator driven by one of the mill motors, the feed roll generator voltage being regulated to keep feed roll motor speed in phase with mill speed. The feed roll generators are excited by magnestats. To overcome delay in feed roll response while the reference from the mill tacho-generator builds up, a separate bias signal is applied indicating the position of the main mill controller. This signal is only a small percentage of the main reference, but it enables the feed roll to move in phase with the mill. The principal signal comes from the mill so that if the mill current limit signal reduces mill speed, i.e., the mill is not running at the speed selected by the controller, the feed rolls will also be slowed down. Close speed matching of the feed rolls is particularly desirable for an aluminium mill in order to minimise marking the material.

Main Tables

In contrast to the main drive, where Ward-Leonard Ilgner control was used to limit the peaks on the supply system, it was decided to feed the main table drive from mercury-arc converters.

The converter drive uses rectifiers connected to the motors through an armature reversing switch. When the motor is on load the converter acts as a rectifier and the motor speed is regulated by grid control. If the motor is to be reversed and has to regenerate, the grid firing is retarded and the armature switch is operated when the motor armature current is zero. Once the switch has operated, the grids are advanced and the converter operates as an inverter, accepting power from the motor and returning it to the supply. In this way a Ward-Leonard type of characteristic is obtained from one set of converter tanks.

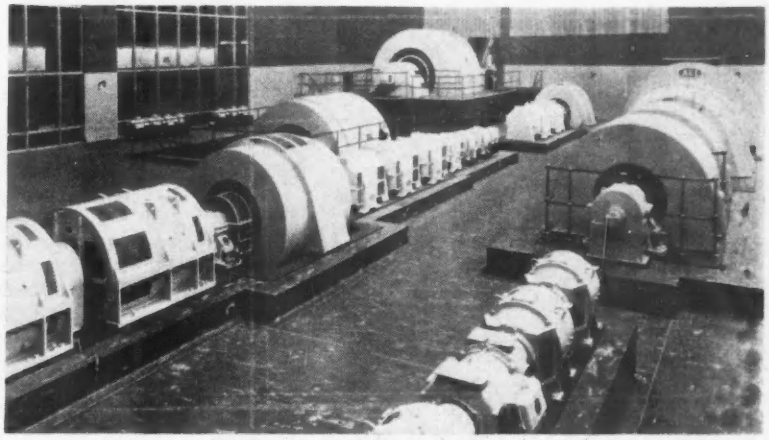


Fig. 7. Hot reversing mill motor room, showing turntable generator set in foreground, Ilgner set on right, main exciter set on left, slab shear set in centre, and the main mill motor

The scheme of control is shown in Fig. 4. The reference for the table control is taken from a tacho-generator driven by one of the mill motors. This signal is compared with a signal from converter volts and the error controls the phase shift amplifier. The output of the phase shift amplifier supplies d.c. reactor windings in the static phase shift circuit which supplies the grid firing circuit. Each pair of converters is connected to five 75 h.p. mill type motors through an armature reversing switch.

When the converters are operating as rectifiers, a positive reference increases the amplifier output to advance the grids and increase rectifier output volts. When inverting, a negative reference advances the grids to reduce the inversion voltage and allow the motors to regenerate. The amplifier output must therefore be increased for positive error when rectifying and for negative error when inverting. The polarity of the error signal is changed by contacts on the armature reversing switch.

The switch is controlled by a static switching system based on NOR units. Each of these NOR units can accept three inputs and the output is only present when all three inputs are switched off, i.e., they are analogous to three normally closed contacts in series. The check quantities are:

(a) Armature current is zero.
(b) The converter grid firing is delayed to the inversion point.
(c) The polarity of the control error is correct.

This ensures that the reversing switch does not break current and that current does not flow at the instant of closing in the opposite position until the grid firing has been advanced again. The system is shown schematically in Fig. 8.

The control scheme has been designed to obtain the rapid changes which are essential with this system. The time taken between the change of reference and the change in motor current (and therefore speed) varies by approximately a quarter of a second depending on whether the reversing switch is operated or not.

The response time of the table drive is so small that no special bias winding is required to keep the tables in step with the mill.

Turntables

The turning tables are situated on each side of the mill next to the feed rolls. These tables are about 50% wider than the other tables and include split rolls with separate drive motors on each side. The split rolls are operated in contra-rotation to turn the piece when necessary during the rolling sequence.

The turntables are driven normally by 75 h.p., mill-type motors, but a booster is connected in series with each motor as shown in Fig. 9. When the tables are used for

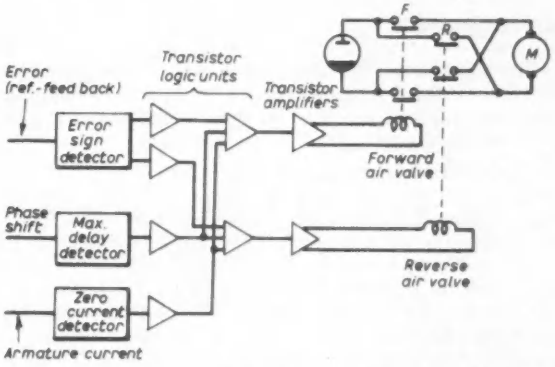


Fig. 8. Armature reversing switch control for converter drive

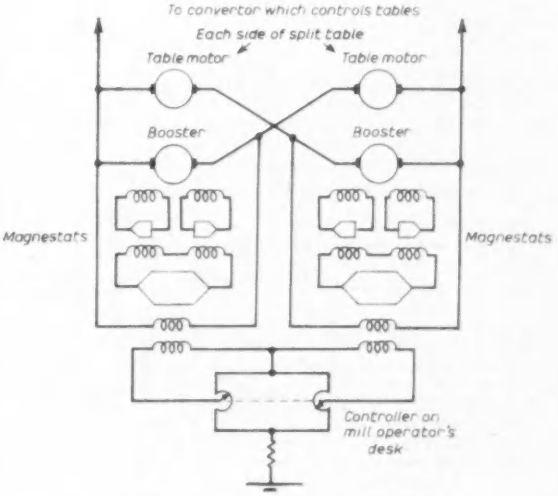


Fig. 9. Schematic diagram for turntable control

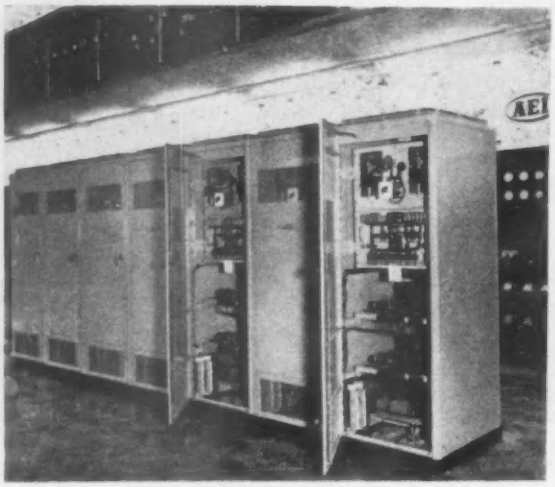


Fig. 10. Magnestats in control room associated with motor room; d.c. panels behind; a.c. panels are on gallery above

turning the piece, the booster voltages are controlled by the operator's control lever through magnetic amplifiers. The boosters are excited with voltages of opposite polarity to cause the table motors to turn in opposite directions.

Screwdowns

The screwdowns control the gap between the rolls and hence the reduction in the metal. For a hot reversing mill the change in roll gap must be rapid and a movement of 2 in. is the normal maximum requirement.

The screwdowns in this mill have a top speed of 50 in./minute and were designed to operate from a controller on the left-hand side of the pulpit desk and in the future by automatic programming. They are also designed to operate with an automatic gauge control system. In order to control the gauge the screws are designed to screw onto the metal during rolling. Under this condition the top screwing speed is limited to 1 in./minute. A switch is available to change screw gear ratio by means of actuators. The screwdowns are designed to withstand the large torques required for screwing onto the metal and some of the parts, for example the main worm spur, are very large. These parts also have to rotate at high speeds when the screws are geared for normal use and in consequence the inertia of the screw is larger than usual.

To obtain fast response of the screws for normal use the screwdown generators are designed to give peaks of up to 3·6 times full-load current on each of the 200/400 h.p. screwdown motors and an exciter has been interposed between the magnetic amplifiers and the generator to give the necessary forcing. The control system is shown in Fig. 11.

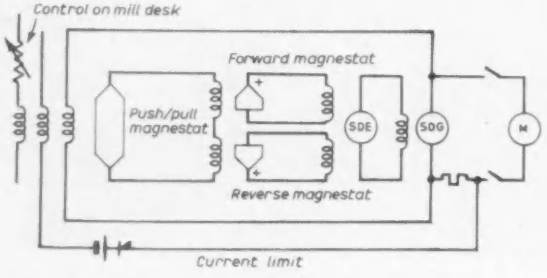


Fig. 11. Schematic diagram of screwdown control

Shear

On the outgoing side of the mill is an upcut shear designed to cut up to 4 in. thick plate. It is driven by two 400 h.p. motors. The operation is cyclic. The operator turns the shear cut switch to the "cut" position and the shear accelerates to full speed before the cut commences. During the cut the motors operate at current limit, and the speed is reduced, so that the motors give up some of their stored energy and the torque produced at the shear is greater than the normal maximum torque of the motors at the current-limit setting. After the cut the motors accelerate to top speed again and are finally slowed down and stopped automatically by limit switches. The operator cannot make another cut until the control switch has been released and allowed to return to the neutral position.

The control regulator system is the same as for the screwdowns and duplicate exciters and magnestats are used but the main generators are designed for the special different duties.

Roll Change Rig

The roll change rig is operated by a 75 h.p. mill-type motor with contactor control. The motor operates a carriage which draws out the nest of rolls in the main mill. The carriage moves on a slide and the motor is designed for a large breakaway torque. Special greasing systems are incorporated to reduce the sliding friction to a minimum.

The motor is controlled from a separate control station at the roll change pit.

Solenoid Controls

A number of the auxiliary drives supplied by Davy and United Engineering Co. Ltd. are hydraulic. The most important of these are the side-guides which square up the metal before it enters the mill. They are operated by a control switch on the main pulpit desk. Foot control is also available to trip the solenoids so that the side-guides can be moved out during rolling while they are being used as centring pushers after the piece has been turned. An automatic control system allows the side-guides on the outgoing side of the mill to move out slightly to prevent the metal from striking the ends of the side-guides, when the ingoing side-guides are positioned up to the metal.

The hydraulic operations are all solenoid controlled by contactors on the main d.c. panels.

Conclusion

The whole of the hot reversing mill project was co-ordinated by Alcan Industries' engineering staff and throughout the design stage close co-operation was maintained between the three main parties—Alcan Industries (formerly Northern Aluminium Co. Ltd.), Davy and United Engineering Co. Ltd. and Associated Electrical Industries Ltd. The programme ran to schedule and the mill is now in operation.

[The author wishes to thank Alcan Industries Ltd. for permission to publish this paper.]

Looking ahead on design

RADICALLY NEW APPROACH TO TRANSFORMER BUILDING

DISSATISFACTION with present-day electrical materials and equipment designs is expressed by Mr J. E. L. Robinson, M.SC., M.I.E.E. (Associated Engineering Ltd.) in his chairman's address to the IEE Supply Section. The dissatisfaction is the proper approach of the engineer, offset by ideas for improvement.

Discussing basic materials, before considering specific types of equipment, Mr Robinson suggests that in some ways development of magnetic material is more advanced than that of dielectrics. Iron has ultimate saturation flux density of about 22·5 kilogauss. A decade ago transformers were still mostly operating at about 13 kG, but with the development of grain-oriented material it can be economic to work at 19 kG. Indeed, but for the necessity for allowing for over-voltage conditions, a density of 20·5 kG would be practicable for large power transformers. This is operation within 10% of the known limit. Mr Robinson thinks there is every reason to expect that better control over metallurgy will yield a more homogeneous material with hysteresis loss, magnetostrictive and noise performance much improved, although perhaps at some economic sacrifice of ultimate working flux density.

Insulation

On insulation, he comments, like many other engineers, on the striking fact that one of the earliest materials—oil-impregnated natural-cellulose paper—is so far unsurpassed for high voltage work in respect of combined mechanical, electrical and life qualities. This despite the fact that it is in so many ways an imperfect material. It involves acceptance of perhaps 150 kV/cm as the maximum a.c. stress, compared with levels of 1,000 kV/cm and more which pure materials can stand: so it is probably only a matter of time before chemists find a way of making a big advance. The great hope for the conductors in electrical machines is superconductivity. If some means can be found of operating within 20°C of absolute zero, the effect on electrical apparatus will be measured in orders of magnitude. In particular, the biggest and most unsatisfactory compromise of present-day techniques would disappear; the designer would enter a field where insulation was required to be simultaneously good electrically and mechanically.

Cables and Switchgear

Turning to discuss particular types of equipment, Mr Robinson begins with cables and here he is particularly provocative. After observing that a.c. makes inefficient use of cable dielectrics, he continues with an assertion that the long-term future of all power transmission must lie with underground cables. Although transmission lines may today be superior to cables on first cost by a factor of about 15%, he feels there is "unmistakably something very nineteenth century about them," and that with further developments of cable dielectrics overhead lines will become outmoded.

Again, Mr Robinson seems unhappy about switchgear. He suggests there is something essentially brutal in the "breaking" of a circuit. Although it works, it does not seem the right way. It seems strange that such similar media as air and oil lead to similar solutions economically. Overall, he does not think it likely that present methods are an ultimate in this field.

Transformer Design

On possible developments in transformers, Mr Robinson (formerly manager of the Ferranti Ltd. transformer dept.) deals with in more detail. Change in this field has been slowly evolutionary. All forms of transformer still involve relatively complicated windings, dependent on a high element of craftsmanship. Moreover, the current tendency is towards greater rather than less intricacy.

Transformers use actively about 85% of the space occupied by magnetic material and some further improvement seems possible. However, conductor space factors are only about 20% in large units, chiefly owing to the demands of insulation and cooling. Although the relation-

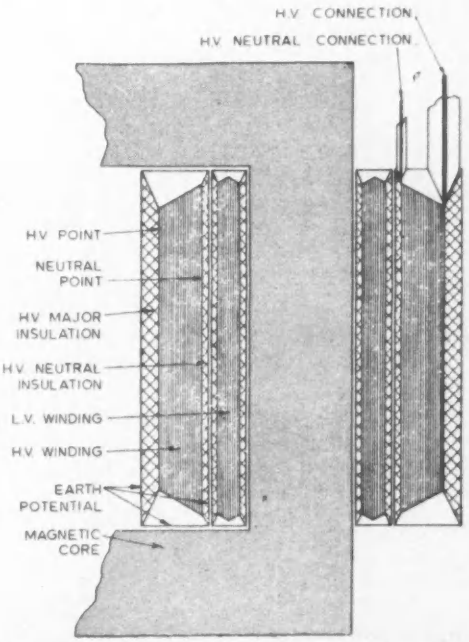


Fig. 1. Axial cross-section through l.v. delta-connected and h.v. star-connected windings of suggested foil-wound transformer. H.V. winding has continuous sheet insulation with capacitance control coatings at suitable intervals. Winding prepared on mandrel, with widths tapered to give required contours at cylindrical ends. On top of winding is formed another capacitance-controlled cylinder, contoured to give equipotentials parallel with end-surfaces of winding cylinder. Cylindrical axial cooling ducts are included in the winding as required. Tapping leads are taken from near neutral end

ships are rather complicated, the weight of the optimum transformer can be taken as inversely proportional to the $\frac{3}{2}$ power of the conductor space factor. If this factor can be raised to 80% then weight and cost will come down to about 40% of present levels—or alternatively, ratings four times higher will be achieved for the same weight.

Mr Robinson suggests that the necessary improvement will be in the form of making each turn of width nearly equal to length of a core leg, and of a few mils radial thickness.

Essentials of this idea are shown in Fig. 1. Advantages include:

1. All solid insulation stressed at a uniform value.
2. Distribution of impulse voltage very closely linear; no local reinforcement of insulation required.
3. Current in windings is free to dispose itself for perfect ampere-turn balance. Axial mechanical forces do not arise. (These are a major limitation with conventional windings.)
4. Since the conductor is thin in the radial dimension, conductor eddy current loss is effectively eliminated.
5. Cooling ducts are in the body of the winding and do not limit working gradient in the major insulation.
6. Tap windings are homogeneous with the main winding in respect of ampere-turn balance and impulse distribution.

To make a transformer of the type envisaged involves many problems of a constructional and manufacturing control nature. Although the conductor will probably remain copper, aluminium with a thin, tough insulating oxide coating has a claim for consideration. Because there will be several acres of insulation between turns on a large transformer, all equally stressed, such insulation must be entirely free from fault. However, so great is the saving in insulation in comparison with conventional methods that even with 5 mils thickness between turns, the new method compares favourably.

It should be possible to make the manufacturing process nearly continuous, and if a successful technique could be evolved the high labour content and craftsmanship of transformer windings would disappear. Cooling systems could be made individually to each leg, the entire winding being enclosed in a cylindrical metal tank with an insulating seam. It would be possible to obtain assembly on site of large transformers from three such complete sealed winding groups. This could open the way to practical use of transformers on several thousand MVA rating.

Earlier in his address, Mr Robinson discusses some essential aspects of engineering, and sees the answer to the problem of too much specialisation in a broader education at school and four years rather than three at university.

Ideas for improving I.E.E. working

CORPORATE members of the Institution of Electrical Engineers received last week a report made to the IEE Council by a special advisory committee set up following stormy general meetings held last summer to consider revisions to by-laws. The committee had the task of reporting to the IEE Council on comments and proposals received from members on activities and organisation of the Institution; and of making recommendations to the Council on ways and means of improving channels of communication between the Council and members.

The Council have decided to send the report to members prior to considering it in detail, to encourage discussion. They warn, however, that detailed consideration by Council may result in some of the recommendations of the special advisory committee not being endorsed.

Better Communication

The report discusses the Institution's working in the broadest manner, and the committee introduce their conclusions by noting that whilst it is clear that some members have become restless and a few seriously dissatisfied with the workings of the IEE, the committee are satisfied that there is nothing basically wrong. Restlessness has stemmed largely from a feeling that Council have become too remote from members, the committee endorsing the Council's own diagnosis that inadequate communications constitute the underlying cause.

Although members have been disturbed for various reasons, the committee are convinced that the majority "would be satisfied by improvement of consultation on major issues, and the avoidance of any semblance of tutelage in communications" of an official nature to local committees or individual members.

Ideas for improving matters include encouragement for local centre chairmen to put forward names for the Council to consider nominating for membership of Council, and encouragement for groups of members to nominate additional candidates. It is suggested that views of members should be more fully canvassed before decisions are reached on what the report calls "major domestic issues" and, to this end, local centre chairmen should be encouraged to discuss Council questions with their committees. So far as individual members are concerned, the committee recommend that there should be encouragement for them to make their views known both when they approve of what is being done and when they have criticism to offer.

London Members

It is thought it may be valuable to give members living in London and the neighbouring counties some sort of local centre organisation such as covers other parts of the country, and so bring them into "constituency" recommendation on Council. It is recommended that a panel be appointed by the Council to study this problem and make proposals about the appropriate reorganisation. General local centre policy is discussed at length in the report, with a number of detailed suggestions for improvements.

The widely canvassed idea that the papers read before the Institution and at present published in the *Proceedings* should be issued only as "separates" is thought to be virtually unworkable in view of the large number of papers read by the Institution. After considering that and several other possible disadvantages, the committee see no justification for a change in the present procedure.

Other recommendations deal with presentation of financial information to members and details for conduct of special meetings and, in addition, with detailed procedure for election and transfer at various classes of membership.

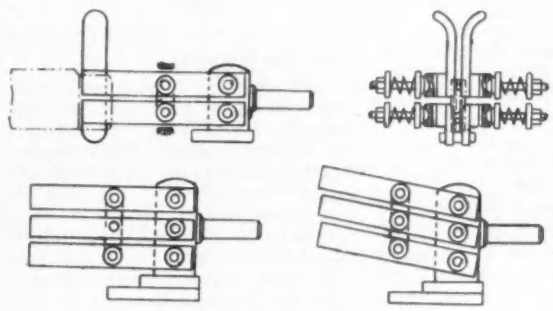
PROGRESS IN PATENTS

SELECTED SPECIFICATIONS

Air Breakers for Icy Conditions

Outdoor high-tension air-break switches are particularly sensitive to icy conditions. Whether manual or automatic, a coating of glaze ice on the contacts may be sufficient to prevent them from opening inasmuch as the holding force is almost invariably applied at the point of greatest leverage. Manufacturers are, of course, well aware of the hazard and endeavour to meet it by a variety of subterfuges, some of which are considered to be of sufficient noveity and ingenuity as to justify patenting.

One such specification, No. 851,729, has just been published in the name of VEB Transformatorenwerk Karl Liebknecht of Berlin-Oberschöneweide, Eastern Germany. The moving blades, of conventional pattern, mate with spring-loaded multi-element fixed contacts between which



Air break switch contacts designed to avoid icing difficulties

they enter with a sliding movement from the top. The upper pairs of elements incorporate leading-in extensions which serve the double purpose of facilitating entry of the blades and also to divert the arc from the normal contacting faces on opening. Such an arrangement is liable to freeze solid under conditions of glaze icing but, to counteract the risk, the inventors pivot the elements of the fixed contacts at the base and cross-link them with a connecting bar so that they move upwards and away from the moving blade within limits on opening. It is claimed that this movement will break the coating of ice and free the blades and this may well be so providing only that the intervening space between adjacent elements is not so filled with ice as to prevent movement. No mention of provision to avoid the hazard is in the specification, but it is obvious that some will have to be made.

Electroplating on Sintered Metal

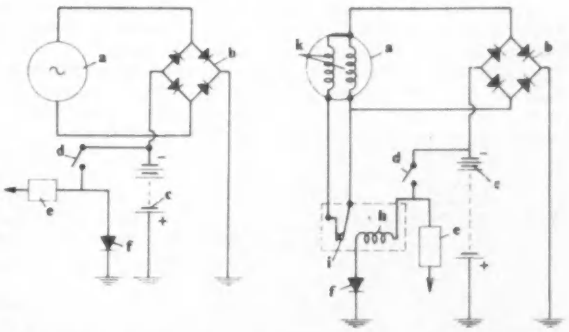
Powder metallurgy is a technique which encompasses many branches of engineering and which is particularly relevant to the ever-widening semiconductor fields. While, therefore, the specification 850,016, credited to AltaIanos Geptervezo Iroda of Budapest, Hungary, is not directed specifically to electrical applications, it is of pertinent interest.

One of the shortcomings of sintered metal components is that they have a porous structure. This is a disadvantage when the component is required to be plated with nickel and/or chromium since the electrolyte penetrates the body of the component, which may lead to disintegration. In the invention, iron-containing bodies made by powder metallurgy are rendered less porous by forming on the outer surfaces a coating of "blue oxide" such as can be made by applying super-heated steam at temperatures of 550°C to 600°C. The coating so formed is found to be a suitable base for direct electro-plating with copper, nickel or chromium. The oxide on the surface is said to close the pores to such an extent that substantially no corrosion occurs under the deposited metallic layer.

Rectified A.C. for Cars

Although rectified a.c. generation with flywheel magnetos has been used for battery-charging and lighting on motorcycles for many years, mostly using copper oxide rectifiers, it has not been applied to any extent in the motor-car industry. Now, in specification 851,625, Joseph Lucas of Birmingham describes a method of regulating the voltage on such generating systems, which enables them to be used on cars and commercial vehicles without hazard to the battery and using semiconductor rectifiers.

The output of the alternator, *a*, is rectified through the bridge, *b*, and applied directly across the terminals of the battery, *c*. The rectifiers prevent reverse flow from the battery to the alternator when the engine is shut down



A zener diode regulator is part of this rectified a.c. car generator circuit

without the necessity for a cut-out. To prevent excessive charge at high r.p.m. of the alternator, a zener diode, *f*, is shunted across the rectifier when the ignition switch, *d*, is closed to give supply to the ignition coil, *e*. At a prescribed voltage the diode breaks down, shunting the flow to the battery but, in the manner of such devices, re-establishing its high resistance as soon as the voltage drops again. The load on the alternator may be limited by inserting a resistance in series with the zener diode.

In an alternative arrangement, the breakdown current through the zener diode is used to operate relay, *h*, which cuts out part of the field of the alternator, so lowering the voltage.

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OVERSEAS NEWS

from our correspondents abroad

CANADA

New Cable Plant

Cables from transmission to communication types are to be manufactured in a new $600,000 factory at Woodside recently opened by Phillips Electrical Co., Brockville, Ontario.

Guarantee against future blackouts for the city of Campbellton was given by Mr J. C. Chatterton at the opening of a new 50,000 h.p. thermal station at Les Boules, Quebec.

Gas Turbine Commissioned

Towards the end of last month, a 26 MW gas turbine was brought into service at the Regina power station, Saskatchewan. The turbine was built by Canadian General Electric and was brought into service earlier than was anticipated to supplement existing generating plant, damaged in an explosion at the station a few weeks ago.

US Defence Orders

So far this year, Canada has received $70 million worth of defence orders from the United States, said Defence Production Minister O'Hurley recently. The bulk of Canadian orders are for electronic components, and Mr O'Hurley hoped that the figure could soon be raised to $300 million. Last year Canada's orders amounted to $96 million.

Generator Arrangement

The imposition of an import duty on steam turbo-generating sets of 700 h.p. and over (noted in our 13 Oct. issue), has obviously pleased some manufacturers in Canada. Such imports have amounted to around $15 million annually in recent years. It is now revealed that the John Inglis Co. Ltd.—Canadian associates of the English Electric Co.—and Canadian Westinghouse Co. are co-operating in a plan for the manufacture of large sets in Canada. The steam turbines will be produced by John Inglis in its Scarborough works (where a 140,000 sq ft extension is in hand), while Canadian Westinghouse will manufacture the generators at Hamilton. Until recently, all large steam turbo-generator sets installed in Canada have been purchased from other countries, but John Inglis have just completed a 100 MW set for Ontario Hydro's Thunder Bay power station and the Canadian General Electric Co. are manufacturing a substantial portion of the two 300 MW sets ordered last December for the Lakeview station in conjunction with AEI of Canada Ltd. Mr H. B. Style, president of John Inglis, said his company had installed special equipment, including test apparatus, for the manufacture of steam turbines up to any size required by Canadian utilities. Mr G. L. Wilcox, president, has explained that the size of the Canadian market for such steam turbo-generators—about $15 million a year for the next five years—was not large enough to justify duplicating the John Inglis facilities for the steam portion of the equipment. But the two companies working together could produce the machines efficiently and economically and could supply an increasing portion of the market.

AUSTRALIA

Remote Supply Scheme

A contributory scheme for electricity extensions has been announced by the Western Australian State Government. Object of the scheme is to enable rural areas to obtain electricity supply more rapidly. The electricity commission will continue to extend their supplies in closely settled areas where they are economical, but consumers outside these areas can now pay for additional extensions. Various schemes for arranging payments are being worked out, including an annual payment, a capital sum to meet initial cost of the line with a further annual charge for maintenance and administration.

Power Too Costly for Farmers

At a recent conference in Devonport, Tasmania, a resolution was agreed calling for a reduction in the cost of providing power supplies to farms. Representatives were told that farmers within a mile of a power supply had found the cost of connection was as much as £500. The conference resolution called on the hydro-electric commission to abolish or considerably reduce such charges.

Bigger Loss

Operations of the Hydro-Electric Commission of Tasmania in the year ended 30 June last resulted in a loss of £180,982, compared with a loss of £55,837 in the previous year, the Auditor-general has just revealed. The loss contrasted with profits of £9,822, £346,403, and £137,951 made in 1958-59, 1957-58, and 1956-57, respectively. The revenue from the sale of bulk power was £1,756,111 compared with £1,683,625, £1,619,339 and £1,421,232 in the three previous years. Revenue from the sale of retail power was £5,290,640 for the year just ended, compared with £4,864,084, £4,599,040 and £4,271,914 in the three preceding years. Total revenue by the commission for the year amounted to £7,285,437. The increase in the revenue for the year was £562,032, an increase of 8·4%.

S. AFRICA

Plant for Komati

Babcock and Wilcox Ltd. are to supply three 900 klb/hr boilers for the second stage of the Komati power station for the Electricity Supply Commission of South Africa. The order for the associated three 100 MW turbo-generators has been placed with MAN, of Western Germany, but the contract provides for the alternator work to be sub-let to AEG (who are providing the first two 100 MW sets for that station). These latest machines are scheduled to be in service in 1963-64. In the first section of the station, the two 900 klb/hr boilers are being supplied by Mitchell Engineering Ltd. as we reported on 23 Jan., 1958.

Iscor expansion programme

A new expansion programme, announced by the South African Iron and Steel Corporation (Iscor), will cost about £270 million and will extend over 12 years. The programme is expected to raise production of ingot tons to 4·5 million a year by 1972. A £56 million expansion programme is already under way and is expected to be completed in 12 months. A wire rod mill, producing 180,000 tons of wire rod a year, has recently begun operating at Iscor.

FRENCH W. AFRICA

Large Diesel Generator Contract

A contract for 16 MW of diesel-generating plant has been placed with the Hawker Siddeley Group by the International iron ore mining project (MIFERMA) in Mauritania, French West Africa. The order is valued at £460,000 and was obtained in the face of fierce international competition.

The generating plant will be installed in two power stations and will comprise

12 Mirrlees diesels driving Brush turbines. Power from the diesel generator sets will supply the entire mining and port handling facilities.

The order, obtained by Mirrlees, Bickerton and Day, is said to be the largest contract placed by MIFERMA with a British organisation and brings the firm's order intake for the current year to £10 million, of which 65% is from the export market.

UGANDA

Kaberamaido Scheme

Commissioning of a new substation at Kalaki in Teso marks the completion of the second stage of the Uganda Electricity Board's Kaberamaido district electrification scheme. An 11 kV power line extension from the main 33 kV system will bring power to three villages. Work on the main system serving the remainder of the area covered by the scheme is expected to be finished by the end of January, 1961.

GREECE

Power Progress

Some impressive figures for power progress in Greece are disclosed in the report for the year 1959, which completes the first ten years since the establishment of the Public Power Corporation. Generation per head of population has risen markedly from 93 kWh in 1951 to 233 kWh in 1959, an increase of 151%. In 1956, simultaneous with the beginning of the second power programme, the Greek Government appointed PPC as the sole agents for generation and distribution of electric power. They were to be responsible for purchasing existing provincial undertakings and applying a uniform low-rate schedule throughout Greece.

During 1959, 77 local utilities were purchased and the number of customers rose to 468,000, an increase of 45%. Sales of electricity at 1,004 million kWh during 1959 showed a marked increase of 23·5% on the 1958 sales. Revenue also rose sharply by 31·3% to Drs 620·7 million. To meet the increasing demand for electricity, which for the last ten years has averaged 13% annually, markedly higher than the 7% annual increase in many Western countries, a considerable development programme is under way. Last year, in spite of unusually dry conditions, hydro-electric generation amounted to 36·2% at 419 million kWh. Total generation in Greece amounted to 1,935 million kWh, of which 735 million kWh was generated by the Athens-Piraeus Electric Co. During the year the first 70 MW section of Ptolemais station was completed and the second section of 125 MW was under construction. At Tavropos three 40 MW units are planned. This year, construction of one of the largest hydro-electric projects in Europe, the Kremasta-Acheloos development, has begun and also a further scheme for 28 MW at Edessaios. New 150 kV transmission lines are in course of erection both for serving Greek districts and also for linking to the Yugoslavian system. In Crete, a 66 kV system, now completed, forms the backbone for the island's distribution.

W. GERMANY

Refrigerator Production

This year's production of household refrigerators in West Germany is expected to be over 2,200,000, an increase of 16% on last year. It was recently stated that every third household now has a refrigerator.

POLAND

Boiler and Turbine Production

The likelihood of rapid expansion is reported for the relatively young Polish turbine and boiler industry. The present five-year plan covers over 400 MW of turbines including 50 MW units. In the subsequent five-year plan to 1965, construction is scheduled for 12-120 MW units with increases to 320 MW units by the beginning of 1965.

In the same period, boiler production is expected to include sizes from the present capacity of 520 klb/hr to 1,460 klb/hr, designed to use hard and brown coal as fuel.

NORWAY

Reactor Start-up

Steam was produced for the first time on 5 Oct. by the heavy-water boiling reactor at Halden, built by the Norwegian Atomic Energy Institute. Claimed to be the first reactor of its type in the world, it is unusual in being constructed inside a mountain and in being operated by remote control. The reactor has a present rating of 5 MW and is being used for an experimental programme by a team of European nuclear physicists. Eventually the output will be raised to 20 MW and it is intended that steam generated by the reactor will supply a nearby pulp and paper mill on a regular industrial basis.

Industrial Plans

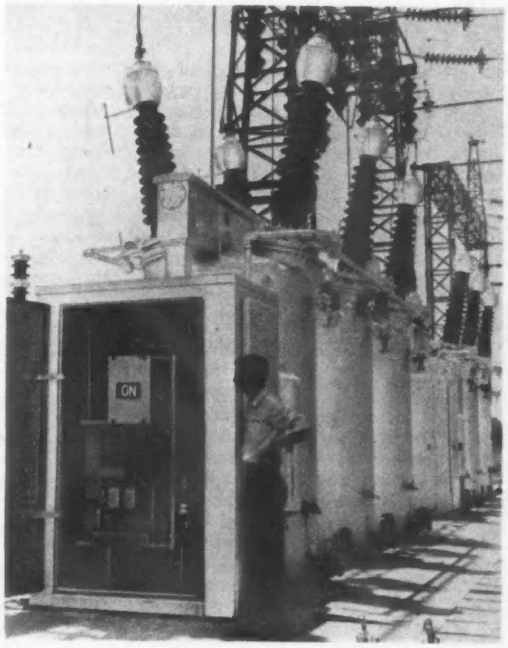
The Norwegian Minister of Industry recently outlined an extensive £250 million industrial expansion programme. Projects included in the plan are a £4 million coking plant to produce up to 250,000 tons annually, a kraft paper mill with an output of 60,000 tons annually, and a new carbide factory to produce 40,000 tons annually. Expansion is also being considered in the aluminium industry, and the iron and steel industry will benefit by a resumption of mining in the Dunderland Valley at a cost of £12·5 million and an £8 million extension of the Mo i Rana iron and steel plant. A new ferro-silicon factory is also in course of preparation.

WEST INDIES

Power Station Closure

Passing of an era in West Indian electricity supply is signalled by a statement that the Bog-Walk hydro-electric station will be closed when the present frequency conversion scheme is completed in 1962. The station, which was commissioned towards the end of the last century, has now become obsolete and in recent years has only produced 500 kW.

Five other hydro-electric stations operated by the Jamaica Public Service Co. require only minor conversion and will continue to operate.



Part of a contract worth over Rs3 million, this outdoor switching station at Roorkee, 140 miles N.E. of Delhi, has equipment supplied by the General Electric Co. Ltd., through its subsidiary, the GE of India Ltd. Our illustration shows one of the five 132 kV, 1,500 MVA oil circuit-breakers. The contract included ten 66 kV, 500 MVA oil c.b's, 53 rotary isolators, 12 three-phase sets of surge diverters, 132 kV and 66 kV voltage transformers, control and relay boards, 11 kV and 400 V indoor switchboards, compressors and batteries. All c.b's are arranged for local or remote operation. Because of the wide variation in temperature and humidity in the area, heaters are fitted above the oil level in the circuit-breaker tanks and in the operating kiosks

Personalities *in the industry*

Mr H.P Barker

Mr H. G. Campbell

Mr J. D. Dale-Lace

Mr N. Robinson

Mr P. McKenna

Chairman and managing director of Parkinson Cowan Ltd., **Mr H. P. Barker,** M. INST. GAS E., M.I.E.E., M.I. MECH. E., M.INST.T., F.B.I.M., was last week elected chairman of the British Institute of Management of which he is a founder member. Mr Barker served an engineering apprenticeship with the Otis Elevator Co. and after a period in business on his own account making electric heaters, and experience with the French meter and instrument firm, Compagnie des Compteurs, joined the board of Measurement Ltd., a subsidiary of Parkinson and Cowan, in 1938. During the war he was for four years with the MAP, latterly as deputy director of instrument production. He subsequently became engineering director of Parkinson and Cowan, then managing director and, in 1956, chairman.

Dr S. English, D.SC., M.I.E.E., F.I.E.S., F.INST.P., has now relinquished his position as chairman of Holophane Ltd., having retired from all executive duties in December last. The new chairman of the company is **Mr H. G. Campbell,** T.D., M.A., A.M.I.E.E., A.M.I.MECH.E., F.I.E.S., who is also managing director of Benjamin Electric Ltd. Dr English, who is remaining on the board of Holophane, was earlier this month made an hon. member of the Illuminating Engineering Society, of which he was president in 1937-38. He joined Holophane 33 years ago as head of their research department, became technical director in 1936, deputy managing director in 1946, joint managing director in 1949 and, from 1955 to 1957, was vice-chairman, afterwards becoming chairman.

Boiler plant design engineer at the headquarters of the CEGB since 1952, **Mr F. Dransfield,** B.SC.(ENG.), M.I.MECH.E., A.M.I.E.E., M.INST.F., has been promoted to power plant design engineer. (*ESH, page 47.) Mr Dransfield joined the staff of the Yorkshire Electric Power Co. in 1916 and became boiler house superintendent with Leicester Corporation Electricity Department in 1924. From 1932 to 1938 Mr Dransfield was boiler plant manager with Castner Kellner Alkali Co. and from 1939 to 1950 was employed by Babcock and Wilcox Ltd., first as a senior service engineer and then as a boiler design engineer. In March, 1950, he joined the staff of the then British Electricity Authority as a senior assistant engineer in the Generation Design Branch of headquarters, and in 1952 became boiler plant design engineer.

Formerly guided weapons service manager to de Havilland Propellers at Hatfield, **Mr J. D. Dale-Lace,** A.M.I.E.E., D.F.H., has been appointed sales manager of Radio Components and Special Products Department, AEI Radio and Electronic Components Division. He was trained as an electrical engineer at Faraday Hse, where he obtained the Faraday Hse Diploma in electrical engineering. In 1940 he joined the Royal Navy as an Electrical Officer and was demobilised with the rank of lieutenant in 1946. He then joined Pye Ltd., of Cambridge, where he worked on the development of television transmission equipment. Mr Dale-Lace went to South Africa in 1947, where he was for four years technical representative for the Sperry Gyroscope Co.'s South African agents. He rejoined Pye in 1951 as a telecommunications sales engineer and eventually became senior export sales engineer for telecommunications and specialised equipment before joining de Havilland Propellers in 1956.

The end of this month will bring the retirement of **Mr L. Douglass,** A.M.INST.C.E., M.I.E.E., from the position of engineer and secretary of the Isle of Man Electricity Board. From 1 Nov. he will be succeeded in that post by **Mr H. Williamson,** A.M.I.E.E., who is now chief assistant. (*ESH, page 179). Mr Douglass took over as engineer and secretary late in 1942, relinquishing the position of district manager to the Cornwall Electric Power Co. which he had held since 1935. Earlier, Mr Douglass was power station superintendent to the Ceylon Government from 1928 to 1930, serving at Colombo. From then until 1935 he was engineer and manager to the Dacca Electric Supply Co., Bengal. He reorganised the Patna Electric Supply Co. system following an earthquake in 1934.

Mr Neville Robinson has been appointed deputy controller of publicity to the General Electric Co. Ltd. and has resigned from Union International Ltd. Prior to becoming advertising manager to the latter concern in 1955, Mr Robinson was with Mather and Crowther and for a number of years their executive for the EDA and British Electricity campaigns. Before the war he worked on the sales side of Radiation Ltd.

General manager of the Perak River Hydro-Electric Power Co. Ltd., **Mr J. P. Hannah,** D.S.O., P.J.K., has returned to this country from Malaya prior to retirement. His successor in that position is **Mr J. W. Smith,** who joined the company in July, 1938 and, since the war, has been successively, distribution superintendent and chief engineer. Newly appointed generation superintendent to the company is **Mr F. B. Monkhouse,** A.M.I.E.E.

Mr P. McKenna, who, as we briefly noted earlier this month, has been appointed marketing director of AEI-Gala Ltd. (the export organisation of AEI-Hotpoint), was previously deputy general manager of their International Division. He joined AEI-Hotpoint in July, 1957, was appointed marketing manager, home laundry, the following year, and transferred to AEI-Gala Ltd. in August, 1959.

To mark his completion of 50 years' service with Nalder Bros. and Thompson Ltd., **Mr E. W. Semmens,** A.M.I.E.E., managing director, was last week presented with a radiogram by Mr A. G. O'Neill, M.I.E.E., chairman, on behalf of the directors. Mr Semmens progressed from a test room engineer to become production manager, and was elected to

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** Denotes revision to the "Electricity Supply Handbook, 1960."*

the board of directors in 1950. He became managing director in 1957. Mr Semmens is chairman of the Instrument Section of BEAMA and a member of the Council of the Scientific Instrument Manufacturers' Association.

Mr R. M. Gledson, B.SC., has been appointed a director of J. Gledson and Co. Ltd., electrical wholesalers, of Newcastle upon Tyne. After leaving Loretto School, Edinburgh, Mr Gledson served his time with C. A. Parsons and Co. Ltd. and graduated in electrical engineering at Durham University. Mr Gledson is the son of Mr W. R. Gledson and grandson of the late Mr J. Gledson, who founded the company in 1912.

Mr Claud Laurence has resigned from the board of Laurence, Scott and Electromotors Ltd. after 37 years' service. His son, **Mr J. A. Laurence,** has been appointed to the vacancy thus created. Mr J. A. Laurence, like his father, is a member of the Stock Exchange, London.

Founder and managing director of Dynamo and Motor Repairs, **Mr T. A. Atkinson** is retiring from full-time employment with the company at the end of this month. He will remain as consultant for a time. Mr Atkinson, who is 68 years of age, founded the company in 1920. Earlier he was works engineer with Lancashire Dynamo and Crypto, which is now also in the Metal Industries group. **Mr C. E. Vincent,** who joined the company in 1958, has been appointed director and general manager of Dynamo and Motor Repairs in succession to Mr Atkinson.

Wolf Electric Tools Ltd. announce that **Mr D. F. Kershaw** has been appointed general manager of their Canadian branch.

Mr E. Humphrey Browne, deputy chairman of the National Coal Board, has been appointed a director of the National Industrial Fuel Efficiency Service.

Messrs **A. K. Graighead, T. I. Hobart, T. L. Reed** and **G. E. Richards** have been appointed to the board of Allied Ironfounders Ltd.

We briefly referred last week to the promotion of **Mr L. E. Gates** as sales manager of Berry's Water Heater Division; we are now able to reproduce his portrait, below. Mr Gates has been Berry's representative in London and the South East for the past seven years.

Mr L. E. Gates

Mr F. J. Edmonds

Mr N. L. Lupton

Mr A. B. Cohen (second from left), chairman of the Southern Rhodesia Electricity Supply Commission for nearly 22 years, retired on 15 Oct. He is seen here with his wife at a reception given in Salisbury by the Federal Minister of Power, Sir Malcolm Barrow, right. On the left is Mr J. W. Phillips, a member of the Commission

In recognition of his 50 years' service with Parmiter, Hope and Sugden Ltd., a dinner was given in honour of **Mr G. Ashleigh Long,** a director and London manager of the company, recently, at which he was presented with a gold wrist watch by **Mr E. W. Sugden,** chairman and joint managing director. Mr Long's career with the company was interrupted by war and, returning to the firm in February, 1919, he became personal assistant to Mr Vernon Hope. Two years later he was appointed northern area representative and in 1930 opened the company's London office. Mr Long, who became a director in 1936, will continue in his present capacity with the company.

At the presentation, left to right: Miss D. B. Long, Mr G. A. Long, Mr E. W. Sugden (chairman and joint managing director), Mrs E. W. Sugden and Mr J. V. G. Hope (joint managing director, Parmiter, Hope and Sugden)

Mr F. J. Edmonds has been appointed general sales controller of Sunbeam Electric Ltd. in charge of the whole of the company's sales and advertising activities. In this capacity he is directly responsible to the managing director. He will operate from the London offices. Mr Edmonds joined the staff of Sunbeam a year ago as general merchandising manager following a period in sales consultancy. He has been engaged in the electric domestic appliance field for many years and was previously general sales manager of Remington Shavers for a number of years.

Mr D. Saward has resigned from the position of managing director of Texas Instruments Ltd. in order to devote more time to his other activities, but he remains a director. The new managing director of the company is **Mr A. N. Provost.** A former naval officer and an engineering graduate of Tufts and New York Universities, Mr Provost served with Sylvania Electric Products, becoming corporate manager of management engineering. Later he was appointed chief engineer of Mergenthaler Linotype, before joining the Semiconductor-Components Division of Texas Instruments Inc. in Dallas, Texas, USA, as chief industrial engineer. Subsequently, he combined this duty with that of chief mechanisation engineer, before being appointed manager of the Special Computer Devices Department in January, 1959.

Formerly commercial manager of Microcell Ltd., **Mr N. L. Lupton,** M.A., A.F.R.AE.S., A.S.M.A., has joined the Plessey Co. as contracts manager of the electronics and equipment group. After war service with the RAF, Mr Lupton joined the Sperry Gyroscope Co. Ltd. in 1941 as a service engineer in their aeronautical department. In 1941 he was seconded by Sperry to the US 8th AAF as an armament specialist and later became founder and chief instructor of the US Power Turret School at Kirkham, Yorkshire. After his return to Sperry in 1944, Mr Lupton held various appointments in the company's Sales Division and then joined Microcell Ltd. in 1958.

Four new appointments are announced by Nash and Thompson Ltd. **Mr R. G. Smith** is now contracts manager, responsible for all sub-contract activities; **Mr A. L. Lee** becomes sales engineer for the Midlands and Northern England, responsible for the sales of metallurgical, process control, survey and electronic equipment; **Mr D. H. Yates,** previously with A. H. Hunt (Capacitors) Ltd. has joined the company as sales office manager and the position of chief inspector has now been filled by **Mr A. Ward,** previously with Wayne Kerr Laboratories Ltd.

Works manager of the Leatherhead factory of Thermega Ltd., **Mr V. E. Swindells,** M.B.E., has retired on grounds of ill health after 32 years' service with the company. He was responsible for introducing a number of patents which made a valuable contribution to the safety and efficiency of electrically heated textile appliances and his advice was appreciated by members of the British Standards Committee responsible for drafting BS 2612 of 1955—the original standard for domestic electric blankets. He was awarded the M.B.E. in 1958 for his work in encouraging severely disabled ex service men and women to become self-supporting citizens. Our photograph above was taken at a farewell luncheon to Mr Swindells, when he was presented with a bedside tea maker.

At the farewell luncheon to Mr V. E. Swindells, works manager of Thermega Ltd., seen in the centre. On the right is Major J. R. Donnelly, managing director, and, on the left, Mr R. E. Mackenzie, the company secretary

Mr A. E. Richards has been appointed managing director of Universal Matthey Products, the joint subsidiary company of Universal Oil Products Co. and Johnson, Matthey and Co.

Mr J. D. Blount, A.M.I.E.E., has been appointed district engineer at Grimsby, No. 7 sub-area of the Yorkshire Electricity Board, to succeed **Mr J. W. Watts,** A.M.I.E.E., GRAD.I.MECH.E., who, as we earlier reported, has been promoted to senior assistant engineer (commercial) at the sub-area headquarters. (*ESH, page 147). Mr Blount received his early training as a student engineer with Laurence Scott and Electromotors Ltd. and entered the electricity supply industry in 1949. He joined the Yorkshire Board in 1953, but took up an appointment as district engineer in Famagusta with the Cyprus Electricity Authority in 1955. He returned to the No. 7 (Grimsby) sub-area as a second assistant district engineer at the beginning of 1959 and remained in that post until he took up his present appointment. Mr Watts entered the industry in 1941 and did his early training with the Ipswich Corporation undertaking. He continued with the Eastern Board until 1958 when he was appointed district engineer at Grimsby. He recently transferred to the Commercial Department succeeding **Mr E. H. Jubb** who was appointed district manager at Gainsborough earlier this year.

Mr T. Hannaby, M.S.M.A., has been appointed general sales manager of Mine Safety Appliances Co. Ltd. Earlier he was for four years sales manager of Multitone Electric Co. Ltd., after being on the overseas sales staff of the Automatic Telephone and Electric Co. for several years.

Belfast Corporation Electricity Committee have appointed **Mr A. H. Willoughby** as generation engineer in charge of the Corporation's power stations. He succeeds the late **Mr H. Weston,** to whom he was assistant. (*ESH, page 177.)

The South Western Electricity Board have appointed **Mr J. H. Sponton** as manager of their Honiton branch, in succession to Mr W. H. Badham.

OBITUARY

Mr W. H. Hay, chief purchasing officer of Gent and Co. Ltd., has died, aged 65. Commencing with the company in 1921, Mr Hay joined the cost office staff where, after a period of two years, he was transferred to the Purchasing Department. In 1925 he was made head of the Purchasing and Stores Department and in 1952 was given the title of chief purchasing officer.

Sir Charles W. C. Marr, K.C.V.O., D.S.O., who supervised the erection of the first wireless station in Australia for the Commonwealth Government, died on 20 Oct., aged 80.

Mr J. W. Arthur, M.I.E.E., who was borough electrical engineer and manager at Reading from 1934 until retiring in 1947, died on 17 Oct., aged 78. He joined that undertaking, then the Reading Electric Supply Co., in 1904, ultimately being chief technical assistant to the managing director. When the Corporation acquired the undertaking he was appointed engineer and manager.

NEW LITERATURE

Electrical Contractors' Year Book, 1960-61

CONFORMING in pattern to its predecessors, this latest edition brings up to date all the information relating to the contracting industry. It is largely devoted, of course, to the membership of the ECA, which, in addition to being presented alphabetically, is broken down into area sections. Other parts of the annual cover the law for electrical contractors, working conditions and standard wage rates, and an index providing quick reference to the various sections. As with earlier volumes, this edition is sure to find a ready use in many offices. Published by the Electrical Contractors' Association. 764 pages, 9¼ in. by 4¾ in. Price 25s.

Electricity in Buildings

edited by T. Dannatt

THERE is often a complaint that architects are insufficiently briefed on electrical services in buildings; that they make inadequate provision for socket-outlets and that their knowledge of basic lighting principles is woefully out of date. The complaint is not invariably justified though there are many instances where a little more thought could have been put into the original planning. In this excellently presented supplement to the Architects' Year Book, Volume 9, a number of contributors, each a specialist in his own branch of electrical engineering, have joined to present a useful survey of the aspects of electrical services in building with which the architect should be familiar. Floor-warming and service lifts, telephones and wiring systems and, of course, a special article on planned lighting all serve to bring the established architect up to date and to make the rising generation more aware of their responsibilities in this field. Published by Elek Books Ltd. Price 10s 6d. 102 pages, 10 in. by 7¼ in., with diagrams and illustrations. Paper covers.

BOOKS RECEIVED

The Million-Dollar Bend, by C. Eisler. Autobiography of Charles Eisler, U.S. manufacturer. Published by the William-Frederick Press, New York, 306 pages, 8½ in. by 5½ in. Price $4·75.

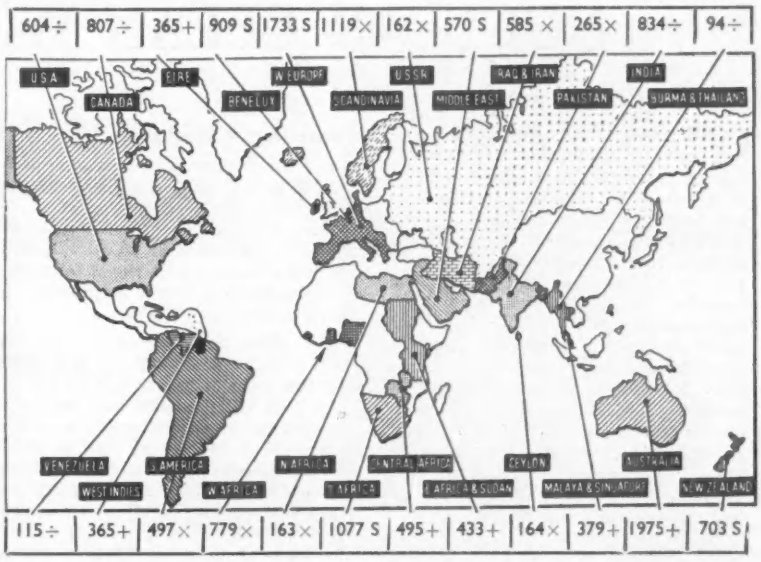
Examples of Structural Steel Design to Conform with the Requirements of BS 449: 1959, by L. E. Kent and E. G. Lovejoy. Revision of an earlier edition showing complete analysis and design for two single-storey sheds with pitched truss roofs of 50 ft span. Published by British Constructional Steelwork Association, 66 pages, 11 in. by 8¼ in. Price 3s 6d.

Enzyklopädie der elektrischen Isolierstoffe. Classification, comparison tables and data sheets, prepared by the Swiss Electrotechnical Committee in association with International Electronical Commission. Published by Schweizerischer Elektrotechnischer Verein, Zürich, 83 pages, 11¼ in. by 8 in. Price Swiss francs 22.

Change at Crewe. Widely illustrated booklet telling the story of rail modernisation on the Manchester-Crewe line. Published by British Railways, London Midland Region, 44 pages, 12½ in. by 9½ in. Price 5s.

Distribution of Exports in £'000's Sterling

×=over 25% increase
+=10% to 25% increase
S=10%+ to 10%−
−=10% to 25% decrease
÷=over 25% decrease
on previous year's figures.



EXPORTS IMPORTS

September

ALTHOUGH slightly higher than in the corresponding month of last year, exports of electrical goods listed in our table were the lowest for 1960, being over £1 million down on the previous lowest total, that for June. It is possible that the strike of tally clerks at the Port of London may have been partially to blame, and later weeks will show whether there has been subsequent improvement.

The total for September, £19,042,110 is, in fact, over £1½ million down on that for August, the traditional holiday month, and in this decline the heavy plant side was the prime sufferer, despite substantial exports of transformers up to 7,500 kVA.

The domestic appliance section are holding on tenaciously to their markets and again topped the £2½ million mark, including an improvement in exports of washing machines.

For cables, there is the familiar story of a further decline, even seriously affecting exports of the thermoplastic covered types.

Australia was our best market for the month, taking goods to a total value of £1,975,544, and South Africa was our only other customer to top the £1 million mark, with £1,077,827. Exports to Canada, in particular, dropped severely, but trade with Western European countries continues at a steady level. The sharp drop in exports to India is indicative of the latter's payments problem.

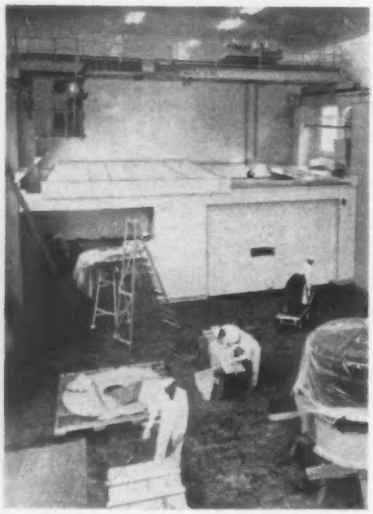
Description	Exports Value (£)		Imports Value (£)	
	Sept., 1959	Sept., 1960	Sept., 1959	Sept., 1960
Generators				
Diesel up to 200 kW	363,766	299,310		
Diesel over 200 kW	203,645	168,458		
Steam turbine driven	4,949	36,977		
Water and gas turbines	163,203	368,967	102,513	106,685
With i.c. and other prime movers	25,778	9,064		
Generators up to 200 kW	95,350	69,430		
Generators over 200 kW	19,947	9,277		
Generator parts	575,035	207,863		
Motors, f.h.p.	186,455	278,674		
Motors 1-250 h.p.	370,998	375,088	164,726	209,717
Other motors	621,010	287,195		
Motor starters and controllers	245,738	246,146		
Converters and rectifiers	61,039	45,348	85,313	199,654
Transformers	661,306	867,050		
Switchgear, to 200 A, mv	293,999	383,010	95,814	130,229
Switchgear, other	750,073	1,012,831		
Total, Electrical Plant	*4,642,291*	*4,664,688*	*448,356*	*646,285*
Batteries, primary and parts	494,289	727,015		
Lamps filament, over 28 V	87,339	93,435		
Lamps filament, under 28 V	22,495	26,457		
Fluorescent and other lamps	98,172	97,046		
Radio and electronic gear	3,119,522	3,424,213	1,504,203	1,623,440
Telephone and telegraphic equipment	1,706,378	1,094,518		
Cookers	32,381	45,189		
Toasters	19,359	15,810		
Other cooking appliances and parts	118,084	94,764	145,361	196,981
Space heaters	21,944	29,259		
Water heaters	20,596	26,467		
Other heaters and parts	91,831	107,605		
Electric irons	71,091	67,884		
Vacuum cleaners	157,850	212,262		
Floor polishers	42,682	39,326		
Food mixers	58,317	58,824		
Washing machines, domestic	377,276	503,590		
Dryers		20,376		
Washing machine and dryer parts	63,359	122,702		
Domestic refrigerators and parts	372,115	722,021	221,042	253,653
Other appliances and parts	212,491	308,516		
Total, Domestic Appliances	*1,661,372*	*2,374,595*		
Portable power tools	174,583	228,270		
Arc welding plant	78,300	71,058	61,176	53,874
Resistance welding plant	49,490	40,143		
Electric furnaces	56,848	118,613		
Signalling apparatus	135,557	126,509	168,213	191,849
Commercial instruments	143,877	172,354		
House service meters	174,937	128,574		
Wiring accessories	166,721	181,190		
Fans	83,958	90,494		
Lighting fittings and lanterns	256,510	319,954		
Other lighting equipment	90,227	88,035		
Telephone and telegraph cable	772,035	198,484		
Paper insulated cables	356,523	442,452		
Rubber insulated cables	245,890	296,330		
Thermoplastic insulated cables	422,889	223,557		
Winding and similar wires	106,553	134,847		
Other cables and wires	135,082	143,708		
Total, all cables and wires	*2,038,972*	*1,439,378*		
Accumulators and parts	287,279	332,125		
Insulating materials	190,830	170,205		
Electrical ware	71,643	63,716		
Industrial electronic control gear	180,604	220,068		
Permanent magnets	41,812	68,627		
All other articles	2,290,671	2,680,830	1,366,106	1,868,917
Total	18,263,651	19,042,110	3,914,467	4,834,999

NUCLEAR CLEAN WORKSHOP

ONE of the problems affecting manufacturers of nuclear equipment is that of ensuring the utmost cleanliness of all components which are likely to come into contact with the gas circuit of gas-cooled reactors. This is entirely separate from the problems associated with the handling of the nuclear materials, as fuel elements and fuel-element cans which have to be processed under conditions of radiation hazard. The non-radioactive components may, however, introduce into the gas stream metallic or other dusts which, distributed by the circulating gases in the reactor, could have adverse effects of a metallurgical or chemical nature on the fuels or canning materials, affecting the life and performance of the reactor.

Materials such as boron, cadmium and cobalt and, in a lesser degree, chromium, manganese, platinum, rhodium, tungsten and vanadium, all of which are alloying constituents of the high duty steels, have high neutron-absorption characteristics. They could be present as fine swarf particles trapped in interstices and left over from machining processes or merely as metallic dusts deposited from non-associated operations in the vicinity. Even the non-absorbing dusts could constitute a hazard if they settle on burst-cartridge detector equipment and cause spurious operation.

All components which will eventually come into direct or indirect contact with the gas stream must, therefore, be freed from all dust and metallic particles and enclosed within a dustproof wrapping or container at the factory. This necessitates a special workshop in which the air is filtered and cleaned and the use of protective clothing for the personnel at the very least.



General view of the GEC nuclear clean workshop at Erith

Converting a Workshop

In a new factory the provision of such a room is comparatively simple but, in many cases, it is more convenient to convert existing space into such an enclosure. The nuclear clean workshop which has recently been completed at the Erith Engineering Works of the GEC is such a conversion.

The dimensions of the shop are 85 ft 6 in. by 42 ft 6 in. by 30 ft high, and this includes the 25 ft by 25 ft by 11 ft 3 in. high reception bay. Melamine surfaced hardboard mounted on a grid framework forms a false roof in which are mounted the flush fluorescent lighting fittings. The walls of the building are also faced with the same material which provides a glossy, dust-free surface overall. The original floor was heavily coated with a lead base paint and this had to be removed before sealing with a special sealant while a metal-free paint, to a close specification, was used on brick and steelwork.

The reception bay is capable of being isolated from the assembly area by partitioning doors and also by a sliding roof which gives an opening 23 ft by 16 ft to permit the transport of larger portions of equipment into the area by means of the 10-ton overhead crane. The outer entry-door which gives access to the reception bay is 16 ft wide by 10 ft 6 in. high. Interlocks prevent more than one door or the roof from being open at the same time.

The air filter system pressurises the area with 35,000 c.f.m. from an air filter and pressurising system, which also incorporates a heating system capable of raising the air temperature by about 40° F in cold weather. A vacuum cleaning plant, driven by a 20 h.p. motor, serves seven take-off points to which the cleaning personnel connect their suction hoses. Compressed air, at 100 lb/sq in. is also provided to eight outlets, four of which are used for the spraying units which cover the cleaned components with Trilac. The cleaning process comprises the removal of scale, rust, dust and grease, coating with Trilac and encasing the component in a polythene bag together with a bag of pelleted desiccant. The bag is subsequently heat sealed.

All operators in the area wear clean protective clothing and skull-caps which are stored in an adjacent room that serves as the personnel entrance. In addition to the measures detailed above, the walls and surfaces of the building are vacuum cleaned at routine intervals.

Common Engineering Exams

Inst. C.E., I. Mech. E., I.E.E.

CO-OPERATION between the three senior engineering institutions was discussed by Prof O. A. Saunders, president of the Institution of Mechanical Engineers, at the Institution's annual dinner last week. He said that the council of the I.Mech.E. were convinced that this collaboration would be profitably developed while retaining the independence of the three institutions. In particular, there was a great need for a common examination structure which would enable a young man to qualify academically for membership of any or all of the three institutions.

Prof Saunders said he felt strongly that it was unreasonable and wrong to expect a man in his teens to make up his mind which branch of engineering he was going to pursue for the succeeding 40 years of his life. He was happy to say that the presidents of the other two institutions had had most cordial discussions with him on this and other matters.

Toast of the I.Mech.E. was proposed at the dinner by Sir Patrick Linstead, rector of Imperial College, U.L. He commented on the current attempt being made to increase the university population in this country to 175,000, double the total of four years ago. He was confident that this could be achieved, and he argued against those who doubted whether the supply of young talent would hold out; those who said the bottom of the barrel was already being scraped. He thought that the barrel had a false bottom; that there was still a lot of good stuff in it.

Expansion Practicable

Sir Patrick quoted a survey of national service recruits to the Army, in which it had been found that of the group classified as "most able," four out of ten had not taken examinations at GCE advanced level. His own experience convinced him that the size of a college could be greatly increased without a fall in standard.

There were three broad reasons why it was good for a young man to become an engineer. It was a wonderful means of education, it established him as a first-class national asset and it gave him an opportunity of improving the lot of the peoples of under-developed countries.

The NEW range of–

"MEMREX-EXEL" 500 volt Switchgear

PRESSED STEEL ENCLOSURES
FOR LIGHTNESS AND STRENGTH.
FRONT OPERATING SWITCH HANDLES.
REWIRABLE OR H.R.C.

10—15—30 Amp. Switches
10—15—30—60 Amp. Switchfuses.

This new range of "Memrex-Exel" switchgear provides the most up-to-date and technically advanced range of 500 volt industrial switchgear yet offered to industry.
Modern styling, sound technical performance and compliance with all relevant British Standard Specifications are basic essentials. The range complies with the most strict interpretation of I.E.E. Regulations (13th edition), and with the requirements of The Electricity (Factories Act) Special Regulations.

Features include

Cases of one piece pressed steel with hinged covers, rustproofed and finished light grey stove enamel.

Front operating switch handles improve appearance and permit more compact assemblies on switchboard and panels.

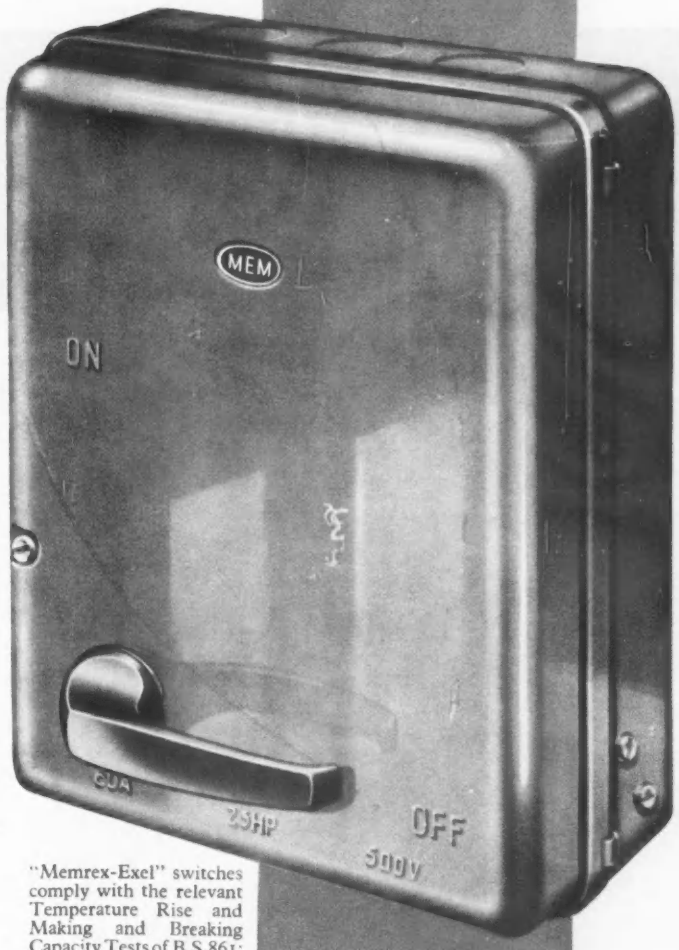
Fuses are of the new "Kantark-Exel" pattern which will accept rewirable or H.R.C. fuses.

Semi-enclosed rewirable (damper type) patterns comply with B.S.3036 : 1958.

H.R.C. cartridge patterns which are interchangeable with semi-enclosed rewirable patterns, comply with B.S.88:1952, Appendix 'J' Dimensions.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88 : 1952, Appendix 'J' Dimensions, Form A—Offset Tags.

M.E.M. H.R.C. cartridge fuse-links are available for use with this range of switchgear. All ratings have been A.S.T.A. certified for Categories of Duty 440 A.C.3 (16,500 amps), 440 A.C.4 (33,000 amps.) and 440 A.C.5 (46,000 amps.).



"Memrex-Exel" switches comply with the relevant Temperature Rise and Making and Breaking Capacity Tests of B.S.861: 1955 and B.S.2510: 1954.

All these and many other features.

MEM

WRITE FOR LIST 447 T

MIDLAND ELECTRIC MANUFACTURING CO. LTD.
REDDINGS LANE, TYSELEY, BIRMINGHAM, 11.

AGAINST

VIBRATION, coming or going is an enemy.

If your instruments are affected by vibration which cannot be stifled at source, protect them on Metalastik Instru-mountings. If you control the installation of the vibrating mechanism — it may be a compressor, or diesel-generator — you can isolate the offending machine on the larger types of Metalastik anti-vibration mounting and thus gain protection for instruments while safeguarding the human being against annoyance and fatigue.

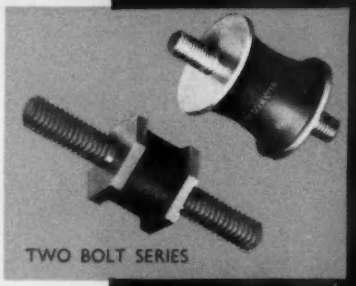
Instrumountings illustrated are :—

TWO BOLT SERIES
In a range of sizes for compression loads of 6 to 210 lb and shear loads of $\frac{1}{2}$ to 90 lb.
Suitable for light machines as well as instruments. They may be fitted in shear and compression to provide various arrangements of the famous Meta-stable mounting system.

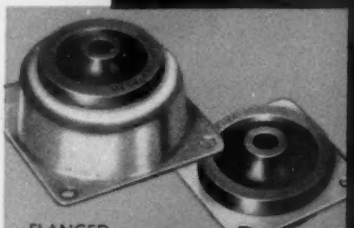
FLANGED INSTRUMOUNTINGS
Pedestal and flat types have the same characteristics, the choice depending on ease of fitting. The Pedestal is particularly useful for insertion beneath complete assemblies. In sizes for loads of $\frac{1}{4}$ to 90 lb and disturbing frequencies down to 800 c.p.m.

EQUI-FREQUENCY MOUNTINGS
With characteristics similar to Flanged Instrumountings, Equi-Frequency mountings are also available in larger sizes for light machinery.

For electronic equipment, control panels and other large installations, Cushyfoot mountings under the complete assembly offer the simplest method of obtaining complete protection from transmitted vibration and shock.



TWO BOLT SERIES



FLANGED INSTRUMOUNTINGS

EQUI-FREQUENCY MOUNTINGS

METALASTIK

POWER SUPPLY

Statistics for September

IN contrast with the month of August, during September the most marked increases in units sent out to consumers by the electricity boards over last year occurred in the mainly non-industrial areas supplied by boards in southern and eastern England. The Southern Board increased its unit sales by nearly 30% over September last year and similar increases were reported by the South Eastern, South Western and Eastern Boards. In total, Area Board sales rose by 19% during the month, compared with last year and even when corrected for average temperature and number of working days, the increase of 13% is higher than for some months past. In the mainly industrial areas, where industrial consumers took more than 50% of the total sales in 1959, consumption rose during the month by 16·6% while in the non-industrial areas, the rise was 23·4%.

Commissioning of plant also showed a considerable increase on the past few months. The output capacity of the CEGB rose by 172 MW to 25,937 MW, an increase of 5·9% on September last year. Largest of the three turbo-alternators commissioned during the month was No. 2 set at Northfleet (London). This machine, rated 120 MW was built by GEC and is supplied with steam from an 860 klb/hr Foster Wheeler boiler. Bringing into service the fifth AEI (formerly BTH) 60 MW alternator at Plymouth "B" (South Western) completes the 120 MW extension programme for the station. The 550 klb/hr No. 5 boiler is of Babcock and Wilcox manufacture. The third set commissioned by the CEGB during September was No. 10 at Spondon "H" (East Midlands). This is a 10 MW alternator constructed by AEI (formerly MV). No new plant was commissioned by either of the Scottish boards during September, but the NSHEB de-commissioned two small installations at Wick and Thurso with an aggregate capacity of 1·23 MW.

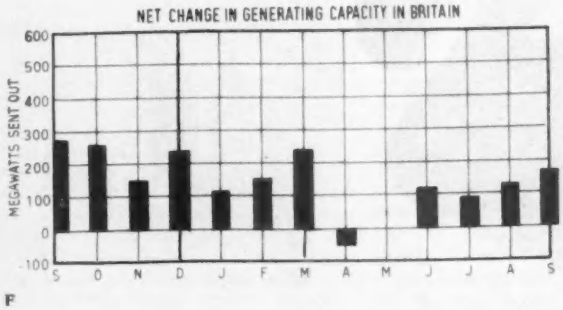
Electricity sent out by the CEGB totalled 7,836 million kWh during September, while for the SSEB and NSHEB the figures were 500 million and 172 million units, respectively. The total of 9,044 million units generated by the three boards includes 169 million units generated by hydro-stations. This represents a 51% increase on hydro-generation in September, 1959.

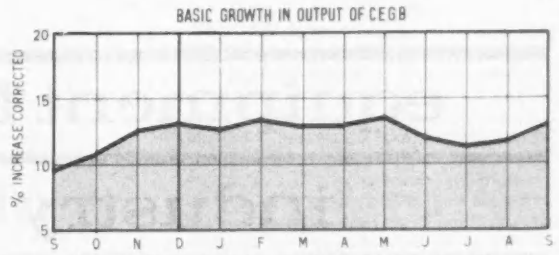
Total coal consumption by the three boards showed a 21% rise over September 1959 to 3,959,000 tons.

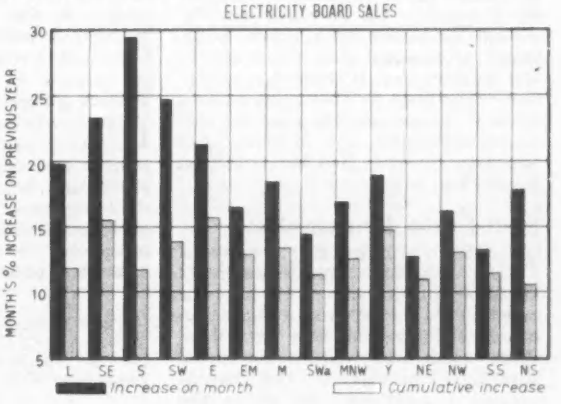
Electricity Board Sales Progress in September

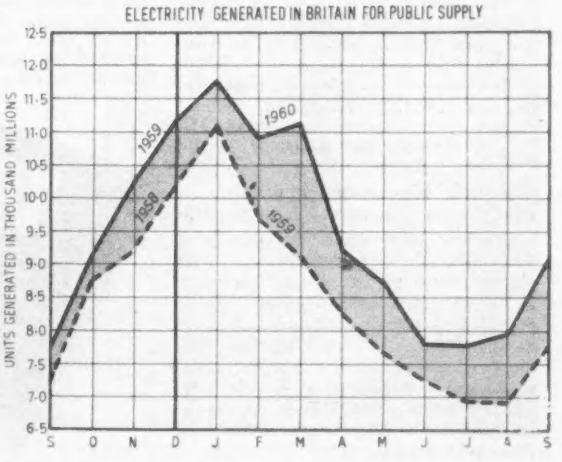
Board	Electricity sent out in millions of units	% increase on Sept. 1959
London	609·3	19·8
South Eastern	465·8	23·2
Southern	648·7	29·5
South Western	301·3	24·7
Eastern	746·8	21·2
East Midlands	650·4	16·4
Midlands	858·3	18·4
South Wales	508·7	14·5
Merseyside and N. Wales	513·7	16·8
Yorkshire	856·0	18·8
North Eastern	488·3	12·7
North Western...	830·8	16·2
Direct Supplies by CEGB	311·2	8·5
CEGB Total	7,789·3	18·6
South of Scotland	586·7	13·7
North of Scotland	133·7	17·7

Table excludes area board purchases from other sources









equipment for industry

Standby lamp and dust extractor

HAVING a 36 W bulb mounted in a translucent enclosure, the "Moflash" standby lamp unit is for use in conjunction with 220/250 V mains. Mains failure operates a relay which switches the lamp on to a built-in 6 V accumulator supply. Incorporated in the accumulator circuit is a mains charging unit and a manual control switch having positions: on, off and accumulator recharge. A red pilot lamp indicates when charging is in progress. The unit is of black enamel finished cast aluminium alloy with integral fixing brackets and is weather-proofed.

Under the same trade name is a dust extractor unit intended for clearing heavy dust concentrations from factory atmospheres. Dust-laden air is drawn through a flameproof fabric filter by a 200 cu ft/min motor-driven fan suitable for 400/440 V supplies. The filter can be easily cleaned by means of a device which shakes accumulated dust into a removable collector tray. If required, a special duct can be fitted for discharging noxious dusts to atmosphere. The extractor unit is castor-mounted for mobility. *The Silvaflame Co. Ltd., 218a Monument Rd, Birmingham 16.*

Special finish for aluminium

A SERIES of three patented processes for providing a corrosion-resistant finish on aluminium and its alloys is based on the formation of a thin oxide-chromate surface film. They form "Bonderite" coatings for which certain special advantages are claimed. The coatings provide a good base for paints and similar finishes while being themselves inherently corrosion resistant. Low process time enables application to continuous strip at rates of up to 60 ft/min while excellent tenacity allows subsequent complex forming operations without damage to the coating. *The Pyrene Co. Ltd., Great West Rd, Brentford, Middx.*

Magnetic base bench lamp

SUITABLE for use in workshops or factory assembly, a portable lamp has a magnetic base which provides rigid support when placed on any horizontal or vertical ferromagnetic surface such as provided by a sheet-steel cabinet. Known as the "Magnetic" local lighting unit, the lampholder and hemispherical metal shade are attached to a flexible stem which enables adjustment at any angle. *A. Douglas Co. Ltd., Lancaster Rd, High Wycombe Bucks.*

Transistor tester

DESIGNED for testing transistors, an instrument recently introduced provides a range of seven collector voltages from 1·5 V to 12 V and incorporates a meter reading voltage and current. There are five current ranges on the meter covering 0 to 100 mA up to 0 to 1 A, and a voltage range of 0 to 25 V. Measurements can be made for n-p-n and p-n-p transistors and include collector leakage current, collector/base characteristic and current gain, the latter being obtained by direct reading. Power supply is from an internal battery which can deliver a maximum current of 50 mA. For higher currents up to 1 A, provision is made for connection to an external mains unit or accumulator supply. The instrument should find useful application in development, inspection and maintenance of transistorised equipment, for example in transistor matching. *Bruton Engineering Co. Ltd., Church St, Twickenham, Middlesex.*

Torque gauge

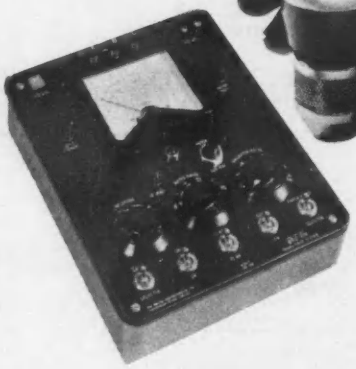
IMPROVED models have been announced of the "Waters" torque gauge. This comprises essentially a collet chuck, accommodating up to ¼ in. shaft diameters, integral with a hexagonal body which incorporates a 300° sweep dial. The gauge can be used for measuring static torque developed by small electric motors or slow-moving torques of units such as potentiometers and variable capacitors. In the case of the latter, readings are taken simply by rotating the unit relative to the gauge body, the shaft being held by the chuck. The dial needle registers maximum torque, accuracy of measurement being ±5% for the standard model. Range of models available covers various requirements such as clockwise, counter-clockwise and bi-directional movements, with calibrations up to 40 oz-in. or its equivalent in gm-cm. With these features the gauge should be useful to those engaged in adjustment or development work of servo-mechanisms and similar equipment. *International Engineering Concessionaires Ltd., 39 Parliament St, S.W.1.*

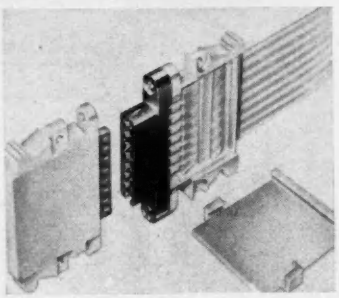
Ribbon feeder connectors

A RANGE of connectors has been specially developed for use with a new type of cable known as ribbon feeder. Comprising up to 18 copper foil strips in flat formation, insulated and symmetrically spaced, ribbon feeder is intended primarily for flexible interconnection of printed circuits. Feeder connectors consist of 8-way and 18-way plug or socket units having identical plastics housings with snap-on lids. Sockets can be of either free or fixed type. Connections to the feeder are made by threading it through slots in the housing and soldering the ends of the strip conductor to terminals provided. The feeder is effectively gripped by the housing slots, thus preventing the transmission of undue mechanical tension to the terminal joints. Two 6 BA holes in the mouldings enable chassis or panel mounting or, if required, the units can be stacked one upon the other. Connector rating is 3 A per contact at 250 V a.c. or 350 V d.c. *Belling and Lee Ltd., Great Cambridge Rd, Enfield, Middlesex.*

Single or bi-directional torques up to 40 oz-ins can be measured with gauges in the Waters' range

The Bruton transistor tester provides seven collector voltages up to 12 V and measures base currents up to 1 A





Ribbon feeder connector by Belling and Lee

for the electrical trade

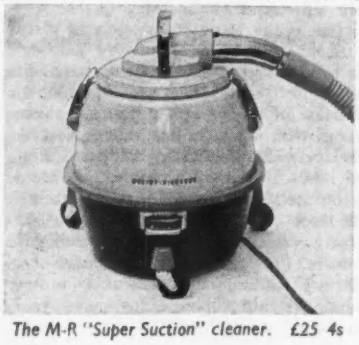
The latest in storage heating

THE commercial/industrial storage block heater field sees further growth with the "Chandran" range of three models. In appearance they are unobtrusive, the straight-edged outer metal casings being finished in silver grey with or without chromium-plated guards. Interiors consist of firebrick, insulated with fibreglass from the outer casing. On a maximum night charging period of ten hours, plus two hours boost, they provide a whole day's heat. Automatic time control switches the heaters on and off during the charging period, whilst the inclusion of room thermostats control the release of hot air during the day. The three models are: 1 kW, 2 kW and 3 kW, all 32½ in. high and 11½ in. deep, with widths up to 34½ in. Prices are £11 10s, £15 10s and £19 10s, respectively. The guards, which are optional extras, cost 15s, £1 and £1 5s. *Green Bros. (Electrical), 19 Market Pl, Brackley, Northants.*

Cleaner for today's carpet

NEW in the domestic cleaning field is Morphy-Richards' new "Super Suction" model, VCA, designed with the modern carpet in mind. It has a spherical floor-standing container mounted on p.v.c. castors, and costs slightly more than the earlier VBA cleaner.

Highlight of the accessories that have been designed for this model is an attachment which, the makers claim, is ideal for cleaning the modern rubber-backed carpet. Since this type of carpet does not allow air to pass through it, an alternative source of air intake is necessary. The new carpet nozzle has a number of ribbed grooves across its underside which compensate for the lack of upward flow by drawing air across the tufts, effectively loosening debris trapped in the pile. Another clip-on attachment provides the user with a general-purpose brush which allows vacuum cleaning and sweeping in one operation. Other attachments include a crevice nozzle, upholstery nozzle and a soft-mane dusting brush.



The M-R "Super Suction" cleaner. £25 4s

The lightweight p.v.c. hose is noteworthy for its swivel-entry cap. This connection allows the hose to be swung into the most convenient position without moving the container. Total reach of the hose and extension rods is 11 ft. A quantity of disposable paper dust-bags and a large detachable cloth dust bag are provided with the appliance.

Loading of the 1 h.p. motor is 750 W. Price £25 4s tax paid. The dust bags are available at 3s for six. *Morphy-Richards, 6 Conduit St, W.1.*

Chic pendant

THE stylish "Parisienne" commercial pendant fitting is a good example of the concentric louvre design for single-lamp units. It has a rod suspension and tapered lamp holder cover from which three chains support the circular outer surround. This surround is pattern-pierced with glass rosettes and supports the white inner louvres. The fitting is designed for use with a 200 W or 300 W lamp and finished in imitation brass. Diameter: 18¼ in. *Courtney Pope (Electrical), Amhurst Pk Wks, Tottenham.*

Scharpf price cut . . .

TWO Scharpf spin dryers have been substantially reduced in price. The Rotadry II comes down from £21 to £16 16s tax paid and the Scharpf Rotadry IV from £29 8s to £23 12s 6d tax paid. Credit claims will be accepted on goods supplied after 1 April by the distributors.

. . . and new service arrangements

A further announcement states that beyond 31 Dec. Continuous Viewing Ltd. will no longer service Scharpf machines. Requests for service should be directed to *Scharpf Service Div., Denham and Morley Ltd., 173-175 Cleveland St, W.1.*

Anglo-American luxury cookers

TWO luxury cookers of remarkable design are the result of a joint effort between John Thompson Instrument Co. and the Tappan Co., of Ohio. John Thompson are to produce the Tappan "400" range of cookers at their Wolverhampton factory and market them under the name "Thompson-Tappan."

The construction of these two units, though novel in comparison with designs familiar in this country, represents the growing American trend of having ovens at eye-level above the cooking-top. Perhaps their most striking feature is the retractable hob, which is slid out of sight at a touch. An impressive panel of controls is placed along the top of the oven in both models, providing seven-position control for the four hotplates and automatic oven timing. Glass doors and concealed oven lighting simplify cooking considerably. The finish of "Lusterloy" and non-porous chromium are said to improve oven baking by reducing radiant heat loss, though all sides are fully insulated. Care has been taken to ensure that cleaning remains as simple as possible. Reflector bowls in the oven units lift out completely and silicone seals above the oven doors are simple to remove and clean. The oven bottoms can be removed completely.

The larger model "442" is 40 in. wide and may be wall mounted or placed on a base cabinet. It has two ovens, one of which contains a rotisserie. In this model the four hotplates are placed in a row, with a maplewood cutting board in front of them. This board can be lowered if necessary. To one side of the oven are fitted two socket-outlets ready to take small appliances, one of which is linked with the time controller. The smaller "436" model retains the most important features of "442," though it has only one oven and measures 30 in. in width.

The rating of the large "442" model is 13·3 kW, and sells at £248, whilst model "436" has a total rating of 11·7 kW and sells at £185. *John Thompson Instrument Co., Ettingshall, Wolverhampton.*

"Thompson-Tappan" model "442" has two ovens and slide-away cooking top

The baby's blanket

A COT-SIZED electric blanket is the latest from Pakamac Special Products Ltd., the firm set up by Pakamac recently for producing electrical appliances. The blanket is about 3 ft long and 20 in. wide and consists of a p.v.c.-covered fibroceta blanket printed with amusing animal figures. Available in pink, blue, green or white, the blanket is waterproof and fireproof and will retail under the trade name "Pakatherm" at £2 11s 6d tax paid. *Pakamac Special Products, Moorside Mill, Oldham, Lancs.*

The "Pakatherm" cot-warming blanket of p.v.c. and fibroceta. £2 11s 6d

TRADE PUBLICATIONS

C.A.V.—Four technical leaflets: 24 V generating set for commercial vehicles; advance information on battery powered tanker discharge; fluorescent light, unit type 363; "Safer Night Driving," tail-lamps and stop lamps. C.A.V. Ltd., Acton, W.3.

STAR.—A brochure celebrating the silver jubilee of Star Aluminium Co. Ltd., 97 Penn Rd, Wolverhampton.

LONDEX.—14-page technical brochure on vacuum and pressure switches.

NEGRETTI.—German version of catalogue T44/G Mercury-in-Steel Recording Thermometer. Also catalogue of instruments for use by Indian Industries. Negretti and Zambra, 122 Regent St, W.1.

KELVIN AND HUGHES.—Components Bulletin No 3 giving amendments to catalogue including three new pages and three revised pages.

MOND.—The Nickel Bulletin: 41-page book August-September Volume 33, No 8-9. The Mond Nickel Co, Thames Hse, Millbank, S.W.1.

INCO-WELD "A." 12-page illustrated technical brochure on a welding electrode and filler wire. Henry Wiggin and Co., Wiggin St, Birmingham 16.

SIEMENS-EDISWAN.—Leaflets on Coventry and Oline ranges of street lamps and timber lamp standards from A.E.I. Ltd., Lamps and Lighting Div., 38 Upper Thames St, E.C.4.

CAMBRIDGE.—New lists of instruments: List 249/2: Extrusion Speed transmitter. Supplement "A" to List 295/1: "Micro-step" precision potentiometer. Temporary list 310: "Numalec" process controller. List 333: CO_2 Recovery and Control. List 331/1: Pneumatic temperature measuring system for use over distances up to 500 ft. List 47/1: Instruments for draught and pressure up to 10,000 lb sq in. Supplement "C" to List 186: "In-Line" scanning recorder up to 400 points. List 62/1: Universal Vibrograph. Cambridge Instrument Co., 13 Grosvenor Pl, S.W.1.

PHILIPS.—Booklet "Lighting Your Home with Philips." 14 pages illustrated text as a counter give-away. Philips Electrical, Century Hse, Shaftesbury Ave, W.C.2.

"THE VITAL LINK."—20-page illustrated brochure produced on the occasion of British Railways electrification conference and exhibition outlining history of carbon brushes. The Morgan Crucible Co., Battersea Church Rd, S.W.11.

IMPALCO.—Leaflet on aluminium roll-welded heat-transfer sheets. Imperial Aluminium Co., PO Box 216, Witton, Birmingham.

STANLEY.—28-page illustrated catalogue No 26 of hand-tools. Stanley Works (Gt. Britain), Rutland Rd, Sheffield 3.

JELTEK.—Leaflet and price list of protective clothing by Jeltek Ltd., Green La, Hounslow, Middx.

The Motor Show

THE 45th International Motor Show opened at Olympia last week. While, of course, chief interest was centred on the main floor where British and foreign cars competed for attention, it was in the galleries that the more important pointers to future developments could be found.

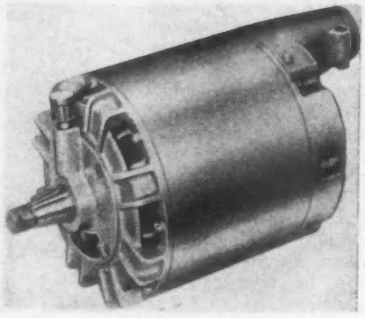
Rectified a.c. Systems

Perhaps the most revolutionary from many points of view was the extension of rectified a.c. generation into the car field. This system has been in use on the smaller two-stroke motor-cycles for years, using a copper-oxide rectifier in conjunction with flywheel generators, but the output of such devices has never been adequate for the family car or larger vehicle. Rectified a.c., using the modern semiconductor rectifiers and transistorised regulators, was first developed for aircraft use and, since the companies making these components were also the major electrical component manufacturers for the car industry, it was inevitable that there should be a move in this direction. The move is now coming.

Lucas and CAV both show a.c. generators which have been developed for automobile use and also for the larger battery charging systems. The Lucas 2AC alternator weighs only 17¼ lb yet gives an output of 45 amp at 11.000 r.p.m. The corresponding d.c. machine with an output of 35 amp at 9,000 r.p.m. would weigh over 26 lb. Advantages of these machines in other directions include the absence of the commutator and better charging at lower speeds, dependent largely on the design of the regulator. By coincidence, a Lucas patent specification on this subject has just been published and is reported on page 641. The Hon Geoffrey Rootes, president of the SMMT, made reference to the development in his opening speech.

Sealed-beam Headlamps

The second development of more than usual interest is the introduction here of the sealed-beam type of headlamp. This has been standard equipment in the States for several years, but it is only in recent times that their production has commenced here. AEI and Lucas are both showing these lamps on their stands.



The CAV. a.c. 24 V generator for battery charging and lighting systems

Engine Tuning

Crypton Equipment Ltd. are showing on their stand the full engine-testing equipment which they have designed for diagnosing loss of performance in car engines without dismantling the engine. A cathode ray oscilloscope with sensing leads clipped over the insulation of the h.t. ignition leads gives pictorial representation of the ignition performance in each cylinder, from which accurate diagnosis of troubles can be made. Other meters check carburation, timing and factors leading to loss of power. Crypton battery chargers include models which enable a flat battery to be fast charged to a point at which the engine can be started after only 15 to 20 sec.

The Exide Press Luncheon

At the Exide Press Luncheon, a regular feature of the Motor Show these days, Mr Edward Powell, sales director, referred to the recent developments in car batteries which had improved considerably both in power-weight ratio and life over the years. He then outlined the position of the lead-plate battery as compared with the alkaline battery and the fuel cell—first made by William Grove in 1840, almost 20 years before Planté introduced the lead-acid cell. Although the fuel cell had a future for battery-driven vehicles, it was still in a distant future. For the present and for car-starting duties, the lead-acid battery would remain supreme for many years to come.

News of the Week

Fair Trading Council To End

All-industry Forum under consideration

WILL an all-electrical industry forum be established to provide a common meeting ground for all sections of the electrical industry when the Electrical Fair Trading Council is wound up on 31 Dec.? This question is before councils of electrical trade associations this week following an exploratory meeting in London at which arguments for and against such a forum were discussed.

Decision to wind-up the EFTC has followed court decisions rigidly interpreting the Restrictive Trade Practices Act to outlaw almost all recommendations for trading procedures. Individual trade associations have had to give up their membership of the Council and recognition of its schedules of discounts.

Much of the effectiveness of EFTC came through its explicit recognition of a code of trading ethics, rather than from any sanctions it was able to apply. Because the Council drew its membership from all sections of the industry, manufacturing, wholesaling, contracting and retailing, it provided an opportunity for discussing the particularly electrical-industry aspects of various problems as they arose. At a meeting called by the chairman of EFTC, Mr T. W. Heather, in a personal capacity, the possibility was discussed of forming some new body through which all parts of the industry could meet for common consultation, but which would in no way be registrable under the RTP Act.

Discussion at the meeting showed that on the whole, manufacturers were against formation of the new forum (though not unanimously); while wholesalers and retailers were for it, provided manufacturers were willing freely to participate. Those in favour argued the urgency of setting up some such body before ties existing through EFTC had passed into memory. They suggested that there would be need from time to time to present the "industry" view to governments and various organisations. The idea canvassed was a small organisation with perhaps quarterly meetings.

Those who argued against forming a new body thought that all that it could do might be tackled better by direct negotiations between individual trade associations on an *ad hoc* basis. They felt that there would be little appropriate business to occupy a new forum, and that there might be serious difficulty in passing on its conclusions without bringing its operations within the ambit of the RTP Act. However, a spokesman for BEAMA made the limited suggestion that manufacturers might be willing to organise an annual conference of representatives of all sections of the industry tacked on to one of the existing electrical industry conferences, at which general matters might be discussed.

After considerable debate, it was agreed that in effect the meeting should stand adjourned, with the trade associations of the electrical industry letting Mr Heather know whether or not they would be willing to support formation of a committee to look into the practicability of setting up an electrical forum.

Pay rises in cable industry

PAY increases ranging from 10s 10½d per week for men to 8s 6d for women employed in the electric cable making industry, operative from 20 Nov., were agreed at last week's meeting of the Joint Industrial Council. There are proportionate increases for men under 21 years of age and for girls under 18. These rises bring the pay for adult male time workers in district No. 1 up to 189s in classification No. 6, and 186s 4½d in district No. 2, and up to 136s 6d for adult females in classification No. 3.

Drawback duty on Accessories

THE Treasury have made another Import Duty Drawback Order. This latest, SI No. 1887, provides for the allowance of drawback of import duty paid on the following goods when incorporated into specified lamp adaptors and exports, viz., certain bottle stoppers with screw adaptors, switches, lampholders and plugs. This new Order operated from 25 Oct.

SYMBOL REVISION

SIGNS and symbols are being revised by BSI following on six years' experience with use of a BS covering the whole range of scientific and technical work. Meanwhile, some minor changes have been agreed immediately, notably "lbf" for pound-force to distinguish it from "lb," pound mass, and similarly "kgf" and "kg." Further, the full stop has been more rigorously abolished. In future the precise engineer will write such terms as "hp" and "Btu."

Plessey bid for Garrard

THE Plessey Co. Ltd. has made a share-exchange offer for the capital of Garrard Engineering and Manufacturing Co. Plessey offer one 10s Ordinary for every 14 Garrard 1s Ordinary; and six 4½% cumulative second Preference £1 shares for every five Garrard 10s Preferred Ordinary. The offer, valued at over £3½ million, is recommended for acceptance by the Garrard directors who state that although there are indications that the second half of the current year may prove more satisfactory than the first, it is clear that the year as a whole will not be as good as the past year. Under the arrangement it is intended that Garrard should continue as a separate entity under its own board, with Mr Hector Slade as managing director.

LATEST ON VACTRIC

THE receiver and manager of Vactric Ltd. has now announced that the business of selling home appliances—both washing machines and vacuum cleaners—which has been operating at a loss, is being discontinued.

The two subsidiaries, Vactric (Precision Tools) Ltd. and Vactric (Control Equipment) Ltd. have emphasised that they are separate companies from Vactric Ltd. and are both proceeding to trade as usual, and will continue to execute existing contracts without any interruption whatsoever.

CONTRACTING WAGE RATES

THE new wage rates for mates and other employees in the electrical contracting industry, increased correspondingly on the 1s an hour rise for journeymen (to which we referred on 13 Oct.) have now been finalised. We list alongside the full hourly rates of pay which will operate from 1 Jan. next. In addition, it will be remembered, the overtime rates are being changed together with the rule on special payments. The 42-hour week applies from 1 Nov. next. It should be made clear that these new rates do not apply to Scotland.

Hourly Rates Operative from 1 January, 1961

Journeymen		Mates	
Grade "A" area	6s 6½d	London	5s 4½d
Mersey District	6s 5d	Mersey	5s 3½d
Grade "B" area	6s 2d	Elsewhere	5s 1d

Category I and II Apprentices

Age	Grades		Mersey District
	A	B	
15	1 3½d	1s 3d	1s 3½d
16	1s 7½d	1s 6½d	1s 7½d
17	1s 11½d	1s 10d	1s 11d
18	2s 11½d	2s 9½d	2s 10½d
19	3s 11d	3s 8½d	3s 10d
20	4s 9d	4s 5d	4s 8d

Manweb's Tariff Warning

ALTHOUGH the Merseyside and North Wales Electricity Board had a surplus of £1·4 million from operations in the year ended 31 March last, the Board is already considering revising tariffs to take account of increased costs of coal, etc. At last week's meeting of the area Consultative Council, Mr D. H. Kendon, chairman of the Board, explained that the surplus, which came from a revenue of £37 million has to be used to provide the £6 million capital expenditure required. Without it, it might have been necessary to curtail supplies to new estates, or rural electrification, which should not be tolerated.

"The recent wage and salary increases and coal price rise will seriously affect the policy, unless prompt steps are taken to recover the extra costs by increasing tariffs," he stated.

Wage and salary increases will cost nearly £600,000 in a full year, but after allowing for that part chargeable to capital account, about £450,000 must come from the sale of electricity and appliances. The extra cost of electricity due to the rise in the price of coal would be £700,000 in a full year. But some £400,000 of that would be recovered from industry under the coal clauses, leaving the net extra cost to Manweb at £300,000, he went on.

The extra cost to Manweb under the bulk supply tariff coal clause was not yet known, but this problem would shortly be discussed by the Electricity Council. In the meantime, tariffs were under consideration by Manweb and the Council would be advised as soon as there were any concrete proposals to consider, he added.

Morse by Typewriter

AN apparatus enabling anyone without telegraphy experience to transmit morse signals was demonstrated in London recently. Called an Automorse, the device has a keyboard like a typewriter and the corresponding signals are transmitted when a letter is pressed. The Automorse weighs 18 lb and can be easily carried with a transmitter. The inventor, Leif Evensen, of Gothenberg, Sweden, is producing the machine in small volume, but larger-scale production is now planned in Norway. So far, there is no mention of a corresponding device to convert morse signals back into typescript. The long-established teleprinter converts perforations in a tape back into typescript, allowing telecommunication without morse in both directions.

£1.6m increase in S.W.E.B. expenditure in 1961-62

THE South Western Electricity Board have been authorised to spend about £6·7 million next year (1961-62) in extending and improving their distribution network—£1·6 million more than approved for the current year.

This extra sum should enable the Board slightly to increase the rate of rural development, Mr A. N. Irens, chairman of the Board, told members of the area consultative council last week. Furthermore, the prospects for the four years 1962-66 were also improved and they not only hoped to maintain that annual rate of expenditure, but were planning ahead to increase the sum, national economics permitting. This would speed rural development and overall system reinforcement which the Board had been compelled to defer.

In the current year the Board were planning to supply over 1,600 farms.

Mr Irens also claimed that the Board was leading the country in the sales of electrical appliances per 1,000 consumers.

Y.E.B. to use computer for a/cs

THE first electricity board in this country to adopt a centralised electronic computing unit is the Yorkshire Board. They have decided to install an English Electric Co.'s KDP10 electronic data processing system, which will come into operation in about two years' time. The Board made this decision after careful investigation into all available systems of both home and overseas manufacture, it is stated.

The YEB intend to centralise the consumer accounting work of the seven sub-areas, replacing the existing punched card installations. For about half of the working day KDP10 will be employed on the processing of data related to about 25,000 consumer accounts and printing out the bills ready for dispatch. This will include balancing and posting the cash receipts associated with the accounts and automatically producing reminder notices when payment is overdue.

It will also produce up-to-the-minute information from details contained in the consumer records, such as consumption of each class of consumer and statistical analyses.

The YEB, serving over 1¼ million consumers, are to set up the system in a building to be constructed for the purpose at Scarcroft, Leeds.

At the official opening of the Kincardine power station of the South of Scotland Electricity Board (to which we referred last week), Sir John Pickles, chairman of the Board, is here seen presenting Mr John Henderson, chief engineer, left, to Her Majesty and Prince Philip

G.E.C. Radio/TV Sales Centre

GENERAL ELECTRIC CO. has concentrated radio group activities for Southern and Eastern England at Hammersmith. Previously radio and TV sales, distribution and service were conducted from eight local branches. The redeveloped site at Hammersmith has 31,000 sq ft of floor area and ample parking space. The company's newly developed colour television receiver was demonstrated at the official opening on Friday. Virtually the full range of natural colours was faithfully reproduced and the eye-strain factor seemed considerably less than from watching black and white television.

OFFICIAL PUBLICATIONS

Co-operation between Industry and Education. Industrial Training Council report. 3s.

Import Duty Drawbacks (No. 12) Order, 1960. SI 1887. HMSO (see page 653).

City and Guilds of London Inst.: 1961 General Regulations. Regulations and Syllabuses: 47. Electronic Servicing; 51. Electrical Installation Work; 56. Industrial Radiography; 57. Electrical Technicians' Courses. 1s each.

BS Amendment slips:

480, Pt. 1, Lead or lead-alloy sheathed cables for working voltages up to and including 33 kV, PD 3895; Pt. 2, Aluminium sheathed cables for working voltages up to and including 22 kV, PD 3896; BS 1050, Visual indicator lamps for use in telephone and telegraph switchboards and for allied purposes, PD 3887; BS 1259, Intrinsically safe electrical apparatus and circuits for use in explosive atmospheres, PD 3888; BS 1299, Tumbler-switches and associated switch-plates and switch-boxes, Part 1. 5 A flush-type, PD 3897; BS 2742, Notes on the use of the Ringelmann chart, PD 3901.

Boiler Companies Integrate

HAVING enjoyed close technical liaison for many years past, particularly in the thermal power plant field, International Combustion Ltd. and Simon-Carves Ltd. now announce that the directors of both companies have considered the possibility of even closer association. They have decided that a measure of integration should be effected resulting in greater overall efficiency in operation and wider fields of application. At the same time the individual identity of both organisations will be preserved and existing commitments and association unaltered. This integration of effort applies essentially to the technical fields, and it is not intended that any merging of capital or financial resources should take place.

Wandleside Link in India

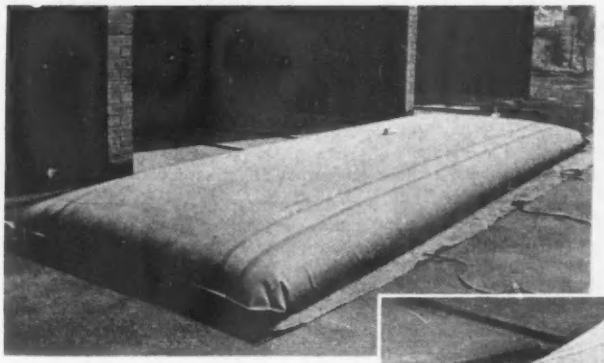
WANDLESIDE Cable Works Ltd. is co-operating with an Indian company in a plan to manufacture cables at Bombay. A new factory will be built with capacity to make about 15,000 tons of wires, strips and cables a year. The Indian partner, National Electrical Industries Ltd., of Bombay, which makes transformers and electric motors, will take a considerable proportion of the cable output. National Electrical Industries has paid capital equal to £600,000. A new company, Wandleside-National Conductors Ltd., is being floated on Indian stock exchanges to carry out the cable venture. The cables will be marketed under the Wandleside brand.

G.E.C. buys factory to boost semiconductor output

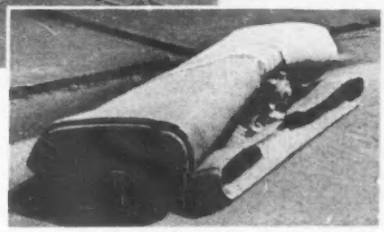
GENERAL Electric Co. Ltd. has bought a 600,000 sq ft factory near Manchester to provide additional space for the Semiconductor Division. The new factory, to be known as Broadstone Works, will employ 3,000 workpeople and 100 graduate staff within three years, GEC says. The present transistor and semiconductor factory at Hazel Grove employs 1,500 people and this plant will continue in full-scale operation, the company states. Production is expected to start at Broadstone early next year.

Douglas raises tariffs

DOUGLAS Town Council, Isle of Man, have approved proposals for increased electricity tariffs. Only rates unaltered are the flat rate for lighting and prepayment rate for lighting and power. Under the increases in the all-in tariff the primary rate is raised from 1·45d to 1⅝d p.u. and the secondary rate from 1·16d to 1⅜d. Similarly, under the flat rate for power, the primary charge goes up from 3·045d to 3⅛d, secondary rate from 2·175d to 2⅜d and the final rate from 1·16d to 1⅜d.



OIL STORAGE MADE EASY



This 1,000 gallon Dunlop collapsible container is used by Yorkshire Electricity Board for oil storage during transformer maintenance. The container above is shown holding about 600 gallons. After maintenance work the oil is pumped back into the transformer through a filter, and the container rolled up as shown (inset.)

SPOTLIGHT ON EUROPE

—McFadzean heads new council

TWO measures to help keep Britain to the fore in export markets were announced by Mr R. Maudling, President of the Board of Trade, during the past week—the creation of an Export Council for Europe, which means a concerted drive in that area, and some extension of the Government's export credit guarantees. Sir William McFadzean, president of the Federation of British Industries, and chairman and managing director of BICC, is now setting up the Export Council for Europe in response to a request from Mr Maudling. The object of the Council is to maintain and develop trade with all European countries.

At the outset at least, the European Council is intended to operate similarly to the successful Dollar Export Council created in the days of dollar shortage; in fact, the two organisations will be neighbours in the City.

But unlike the Dollar Export Council, the Export Council for Europe will not have representatives abroad at this stage. Instead, Sir William McFadzean intends to initiate promotional activities through existing bodies such as joint chambers of commerce in European countries and through British firms abroad and to bring home to British importers the facts and potentialities of the European market. One way in which it is thought the new organisation will be helpful is by arranging for industrialists who are already successful in exporting to Europe to explain their techniques to others.

There was a special problem in Europe, Mr Maudling said, because it was one of the most rapidly developing markets in the world and because of the division between the Six and the Seven "which we all deplore." Mr Maudling said Britain wanted to be in a position to take full benefit of a single European market "as and when it comes about, which I believe will happen and ought to happen."

A number of important bodies have already agreed to sponsor the new Council, including the Federation of British Industries, the Association of Chambers of Commerce and the TUC.

Industry will be responsible for the direction of the Export Council for Europe but, as in the case of the Dollar Export Council, the Government will provide roughly half the finance and will collaborate to the full. Terms of reference and membership of the Council are to be announced. A committee will probably comprise about ten representatives from sponsoring bodies and about 15 from a wide cross-section of industry.

. . . Longer Credit

INSURANCE for credit for exports for periods longer than five years will be permitted in future through the Export Credits Guarantee Department when it is shown that there are strong commercial grounds for winning a contract. The lengthened insurance will be offered only where it can be shown that a foreign competitor is offering similar long credit, with the help of an official organisation. Each case will be considered on its merits, and there will be restrictions about the countries to which the extension will apply.

Another change in ECGD practice is to offer part-period cover where there is no official backing for the foreign competitor. In such cases, if the UK exporter needs to offer more than five year's credit to win the order, ECGD will make available cover for the period it would normally have done, with the exporter carrying the risk for the remainder of the longer period. ECGD has not previously been authorised to give such part-period cover.

Towers could improve housing areas

— *Landscape Architect*

PARLIAMENT should make it easier for the electricity boards to erect lines over private houses and gardens. There was no danger and some housing areas might even be improved by the construction of towers which would give focal points of some scale. For these built-up areas to be sacrosanct at the cost of an open stretch of green country was deplorable. That was the view expressed by Miss Sylvia Crowe in an address to the Institute of Landscape Architects last Friday. She emphasised that the overhead line problem was the most difficult facing the landscape architect today. It was not considered economical to go underground with a cost 13-17 times as great as for o.h. lines.

Each line had to be considered on its merits. But the problem of avoiding air routes, radar stations, radio transmitters, built-up areas and other lines made it increasingly difficult to avoid altogether beauty spots, green belts or precious strips of open country.

More research was needed into insulation problems to make it economically practical for o.h. lines to be undergrounded. A renewed effort was essential, she said; neither electricity nor the landscape were sectional interests; they were national amenities.

With nuclear power stations sited in remote areas, the landscape architect's aim was to push the wild landscape close up to the boundary of a station and not let its influence stray outwards in a suburbia of roads, buildings and embankments. The problems with a coal-fired station were different. Technical developments in the conventional field were now so rapid that modifications during construction made it impossible to produce a final landscape plan; alternative transmission connections might be needed or new buildings required.

The scale of power stations tended to overpower their surroundings, but landscape treatment must strive to reconcile the disparity in scale, she went on. Miss Crowe also thought that the overhead line structures in substations resembled gallows, while the spike-disintegrated shapes of switchgear and transformers were spread over too great an area.

Appliance Development Rumours

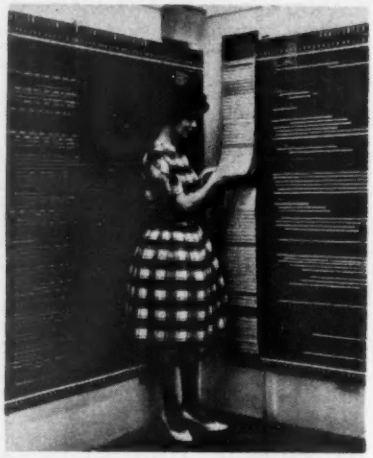
VARIOUS rumours concerning new appliances being developed by Hoover Ltd. have been circulating in recent weeks. Although there is no official confirmation of any of these it seems very likely that a new fully automatic washing machine may be the next introduction by that firm.

It may also not be very long before Ada (Halifax) Ltd. provide further news. That concern, control of which was recently acquired by Philips Electrical Industries Ltd., is seeking a design manager "responsible for the design and development of a new range of domestic appliances with particular emphasis on washing machines."

G.E.C. sells graphite "know-how"

NIPPON DENKYOKU (Nippon Electrode Co.) will pay £50.000 plus royalties to General Electric Co. for the right to manufacture and sell anywhere except in the UK two special types of graphite developed by GEC for use in nuclear plant. GEC will provide technical staff to help the Japanese company build a new plant. Initially for ten years, the agreement is subject to approval by the British and Japanese Governments. One of the graphites is impermeable, on which Nippon Denkyoku will pay 10% royalty; the other has low permeability and royalty is 7½%. These materials could be used outside the nuclear field.

Plotting Construction Progress



THESE wall charts are used by CEGB's Northern Project Group, Manchester, to record progress of construction of generating stations. A separate chart is used for each station, and the use of coloured indicators enables an instant appraisal to be made of work done on each phase of construction, in relation to schedule. The card index at the side contains detailed information.

Prestcold expands output

PRESTCOLD will soon be a bigger force than ever in the refrigerator market. Finished goods were beginning to flow from the production lines at the new £5 million factory at Swansea, the sales director, Mr D. A. Field, said at the opening of a showroom in Worcester last week. Other appliances would be manufactured at Swansea in due course.

HOME HEATING PLANS

THE sum of £235 was a "small price to pay for contented tenants," Treasurer W. L. Berwick maintained at last week's meeting of Anstruther Town Council. He moved a successful motion that gas and electricity be laid to proposed new houses at Milton Cres, to give tenants freedom of choice. The Council agreed to rescind an earlier decision that the houses should be all-electric.

London County Council Housing Committee have approved a £647,600 second-stage scheme for the development of a site at Rotherhithe New Rd, Bermondsey. This includes another 16-storey block of flats and three four-storey maisonnette blocks, all with electric floor-warming. The high block will have two high-speed lifts.

Ripon-Pateley Bridge Rural Council are considering the form of heating to be installed in "special accommodation" to be erected at Station Sq, Pateley Bridge. Representatives of the North Eastern Gas Board demonstrated gas space-heating units to the Housing Committee, who agreed that either gas or electric heating, other than floor-warming, should be installed, and the architect, Mr J. C. Kenyon, was asked to obtain details and quotations for suitable electrically heated systems.

Perth's multi-storey flats to be built at Potterhill will be electrically heated, similar to those at Pomarium, the Council's Housing Committee has decided after considering a letter from the Scottish Gas Board.

Some 75 members and guests attended the dinner of the Association of Managerial Electrical Executive at Southport last Friday. Seen below are, left to right, Messrs W. J. Forster and R. M. Gravett (both of Manweb), P. H. Flatt and W. C. Parker (N. West, Merseyside and N. Wales Division, CEGB), R. E. Wacher (CEGB) and D. G. Dodds (Manweb)

Automation in the Steel Industry

THE first step towards automation in any industry is full instrumentation of plant involved. This was emphasised by Lord Halsbury, opening a recent conference at Buxton, on the application of automation to the iron and steel industry. Organised by the British Iron and Steel Research Association to stimulate general interest in this subject, the conference was attended mainly by delegates from the steel industry. Also represented were firms concerned with instrumentation and control, and other industries and research organisations interested in automation techniques.

It was explained at the conference that by means of instrumentation complete data was obtainable to formulate operating rules necessary for "on line" computers used in controlling individual stages of a production process. Before automation could be applied to the process as a whole, careful study was required to understand its logic and to assess economic aspects. In terms of the steel industry, it was pointed out that there was extensive instrumentation of many steelworks processes today which could thus be adapted to computer control. Examples were blast and open-hearth furnaces, cold- and hot-strip mills. A degree of automation had already been applied in these instances, such as width measurement and correction of hot strip. There were, however, still some difficult problems to be solved, particularly in respect of quality control arising out of lack of suitable instrumentation. There was, for instance, no known reliable method of continuous furnace melt analysis.

I.E.C. talks meters

INTEGRATING meters and indicating instruments were up for discussion at a meeting of the International Electrotechnical Commission measuring instruments committee held in Paris recently. As a result of decisions taken, a draft is to be circulated of recommendations on reactive voltampere meters while another will deal with terminal markings for indicating instruments. Clearance was given for publication of recommendations dealing with watt-hour meters. There was intensive argument about direct-writing slow-response recording instruments and a working group was set up in an attempt to produce an agreed solution. One of the sub-committees began consideration of recommendations on signal generators but did not complete its work.

Weybridge-Chessington Line

LAST of the objections to the route of the proposed 275 kV transmission line from West Weybridge to Chessington were heard at a public inquiry at Cobham recently. Total length of the line is to be ten miles and wayleaves for all but four sections totalling half a mile have been obtained by the CEGB. The disputed half-mile concerns properties at Esher, Cobham, Walton and Weybridge, and Byfleet.

Automation factory expands

WORK will start immediately on expansion of the Lanarkshire automation equipment factory of Honeywell Controls Ltd., a wholly owned subsidiary of Minneapolis-Honeywell Regulator Co., of the US. Mr C. W. Spangle, managing director of Honeywell Controls, said this week that the Board of Trade would finance the building, which would increase floor space at Motherwell from 190,000 sq ft to 350,000 sq ft and cost about £500,000, and Honeywell would spend at least as much again on plant.

New constitution for automation body

THE British Conference on Automation and Computation which, since its formation in 1957, has been divided into three autonomous groups—broadly automation, computation and sociology—this month merged the groups under a central council, with management in the hands of an executive committee. However, the 31 member organisations will continue to act individually as well as jointly to foster progress in the fields of automatic control and computation. Under the new arrangement, BCAC will act as a clearing house for information on the relevant activities of members (of which the Institution of Electrical Engineers is one). The information will continue to be published in the BCAC Bulletin. At a meeting on 10 Oct. Sir Walter Puckey was elected chairman, and Mr W. K. Brasher (secretary of the IEE) was elected honorary secretary.

LARGE ORDERS RECEIVED

FOUR 75 MVA three-phase transformers have been ordered from Associated Electrical Industries by the CEGB for Templeborough substation to step down the 275 kV supergrid voltage giving a 33 kV supply to six 40 MVA arc-furnace transformers to be installed by Steel, Peech and Tozer. The AEI transmission transformers will be of the outdoor oil-filled type with natural cooling up to 50% loading and forced-oil circulation and air-blast cooling for higher loadings.

SWITCHGEAR for extensions to CEGB power stations at Aberthaw and Swansea North has been ordered from AEI switchgear division. For Aberthaw, seven 132 kV, 3,500 MVA indoor air-blast breakers and control equipment are involved, together with three 6·6 kV, 250 MVA metalclad auxiliaries switchboards and associated relay panels. Total value of the order is £300,000. The Swansea order covers development of two existing transformer feeders into a ten-switch double-busbar substation and nine 132 kV, 3,500 MVA oil circuit-breakers and ancillary equipment are involved in a £250,000 order.

SIX switchboards and 25 local control panels now being made at the Blackwood Works of South Wales Switchgear Ltd. are for export to Rumania. The equipment, of which the switchboards are 6·6 kV, 250 MVA single-busbar air-insulated design, will be used for process motor control in a Kraft bag plant being supplied by Lyddon and Co. The contract is valued at £35,000.

A CENTRIFUGAL blower of 100,000 c.f.m. capacity, for delivering air to blast furnaces, has been ordered from GEC by Dorman Long (Steel) Ltd. To be installed at Cleveland, the blower will be driven by a direct-coupled steam turbine supplied at 425 lb/sq in., 725°F. Value of the order is £139,000. Condensing plant is to be supplied by Mirrlees Watson Ltd., of Glasgow.

A £950 Dexion Glidewheel gravity conveyor system for cartons and packing paper just installed at the Wembley works of Berry's Electric Ltd. The installation is suspended from the roof trusses on slotted angle structure, leaving clear floor space. Cartons are now made up in a first-floor store and fed on to two main assembly lines and take two right-angle turns before entering the final sections

N. Scotland island problem

WITHOUT Government aid there is no hope whatever of either Barra or North Uist getting a supply of electricity in the next five years, Lord Strathclyde, chairman of the North of Scotland Hydro-Electric Board, told local Council representatives at a meeting in Inverness earlier this month. He thought it extremely unlikely that they might get a supply in ten years, but it might be given in 15 years, was the only hope he could offer. Cost to supply Barra, by submarine cable, had been estimated at £262,000. To supply North Uist would cost £700,000, it was stated.

After subsequent discussion on hydro-electric schemes, including the Nevis project, Lord Strathclyde pointed out that since the Board had been in existence it had brought electricity to 102,000 rural consumers and the loss the Board was carrying today as a result of those connections was £1,604,400. They could only carry that loss by making a profit on any electricity sold to the south.

Permanent home for Royal Show?

THE Royal Agricultural Society are negotiating to lease from Lord Leigh a site for a permanent base for the Royal Show at Stoneleigh Abbey, near Kenilworth, Warwickshire. The site, about 500 acres, is some five miles south of Coventry and ten miles to the east of the M1. The lease will cover an initial period of seven years and it is expected that the site will be ready for the first show to be held there in 1963, following the 1961 show at Cambridge and the 1962 show at Newcastle upon Tyne.

For some time now, the Society has been seeking a permanent home for the show in the Midlands instead of the more expensive system whereby the show is staged in different parts of the country each year.

Sayings OF THE WEEK

"There is something essentially brutal in the 'breaking' of a circuit. Although it works, it does not seem the right way." . . . MR J. E. L. ROBINSON, in his chairman's address to the IEE Supply Section.

"It is unfortunate that the surplus hangs down like a ripe cherry from a tree, which just needs picking." . . . COUNCILLOR W. L. WILLIAMS, in discussion on tariffs at Merseyside and North Wales Electricity Consultative Council meeting.

"Some people say we are scraping the bottom of the barrel. I do not agree. I think the barrel has a false bottom and there is a lot of good stuff still in it." . . . SIR PATRICK LINSTEAD, rector of Imperial College, UL, speaking of the plan to double the university population over four years.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, October 25

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	220½	−2
„ (3 months)	222	−2
LEAD, refined pig, 99·97% purity (cash)	68	+⅜
„ (3 months)	69	+⅜
TIN, refined, min. 99·75% purity (settlement)	801	−8
„ (3 months)	796	−2
ALUMINIUM, ingots 99·99·5%	186	—
„ wire bars (4×4×54")	193½	—
BRASS Strip 63/37	197½	−3½
SILVER (Troy oz)	79½d	—

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	88½	+⅞
„ (3 months)	86½	+⅛
RUBBER, per lb No. 1, RSS, spot	28½d	−⅛d
c.i.f. basis, ports, Dec.	27½d	—
ARMOURING: Galv. Steel Wire (0·104 in.)	66½	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70½	+½
AMERICAN PRICES: Copper, electrolytic (per lb)	30c	—
Lead, (New York)	12c	—

* *Tape Price, now an average, includes varnishing*

Standard Lamp Life

WHETHER the nominal life of 1,000 hr is the right value for a British Standard is discussed in the October issue of *BSI News*. BS 161, Tungsten Filament Lamps for General Lighting Service, specifies this life, but a question has been raised whether it should be extended in view of improved manufacturing techniques. The BSI committee responsible for this and other lighting standards is quoted as saying that the figure aims to give the user light at the lowest overall cost presupposing normal operating conditions, freedom from vibration and shock. Lamps complying with BS 161 are found on test to give an average life greater than the minimum 1,000 hr; where unusual conditions are present, they are best made by use of lamps of the next higher standard voltage than the declared value of the electricity supply. There is warning, however, that such a step is only economical in special cases, as extension of life can be obtained only at the expense of lamp efficiency and, hence, reduce light output. The hard fact is that full lamp life and light output per watt are inseparably determined by filament working temperature.

Export prospects good

BRITAIN'S export prospects remain good for the final quarter of 1960, according to General Electric Co.'s economic and marketing research unit. Ceylon, USA and Venezuela are the only countries in which the outlook is deteriorating, with the proviso that the newly independent states of British Africa may not be such safe markets as in the past. Prospects are considered to be improving in Argentina, France, Iraq, Malaya and Portugal.

One cloud on the horizon is the speeding up of moves by the Six towards a common external tariff which, the survey says, would entail very serious discrimination against outsiders. The survey clearly favours acceptance by Britain of the principles of the Rome treaty, which is not surprising as Britain's exports to other countries in the Seven are still only two-thirds of her exports to the Six. Conditions for a *rapprochement* with the Six are more favourable than for months, because of acceptance of the need for Western Unity and because Dr Adenauer and President de Gaulle appear to have agreed that political integration of the Six should not be pursued—but time may be running out, the survey states.

News in Brief

The first of four 120 MW turbo-generators at Skelton Grange "B" power station was commissioned last Friday.

HRH Prince Philip has been invited to officially open Belfast's new power station. On 1 Nov. next the Princess Royal is to open the Coolkeeragh power station of the Electricity Board for N. Ireland.

The GEC have prepared a 16 mm sound film in colour of the soil-warming cable installation at Murrayfield, which is available for free loan.

Queen's University, Belfast, have ordered a Deuce computing system from English Electric for the Applied Mathematics Dept.'s plan to expand into space research.

BSI have started work on a standard method of test for resistance per unit length of metallic electrical resistance material. A draft has been prepared based on BS 3239, the corresponding standard for conductor materials.

Last Tuesday Lady Nelson officially opened the new headquarters of the English Electric Group (which we described on 1 Sept.).

In our reference to Kincardine generating station in 13 Oct. issue we referred, in error, to auxiliary transformers supplied by Watford Electric. They were, in fact, supplied by Transformers (Watford) Ltd.

Thermair Domestic Appliances Ltd. announce that they have discontinued production of their "Saturn" spin dryer.

Company Activities

IS the Stock Market now moving in anticipation of some easing of the "squeeze"? The fact that private investment buying as well as that of the Institutions continues to underpin the market despite the worsening of the sales position with the motor industry and the majority of domestic appliance suppliers, suggests that this might be the case. It is true that last week Mr Selwyn Lloyd, Chancellor of the Exchequer, gave the Treasury view that it is "too soon to talk of demand becoming insufficient" and again repeated his Scarborough decision that the credit curbs would be eased as soon as it was thought safe to do so in the interests of the economy as a whole. The emphasis is on the last three words. But apart from the general clamour which is now growing to ease the squeeze, the Chancellor has before him the conclusions of the latest Federation of British Industries industrial questionnaire (to which we referred last week). Belief, therefore, grows that where the maximum repayment period on H.P. contracts is to two years there may soon be an extension to three.

Then there is the question of Bank rate. Following the recent French reduction and the continuing outflow of gold from low interest rate USA, City opinion is that both W. Germany and the UK will not be long in following with cuts. This then was the background to a firm if unexciting industrial market.

Electrical shares for the most part saw very little activity although there were a number of useful exceptions. AEI starting out the week at 43s 3d dropped to a new 1960 "low" of 42s 3d but recovered to 42s 9d following investment buying. English Electric showed greater strength at 34s 3d, a rise of 1s 9d. Parsons were 2s a share dearer at 46s, while "twin" Reyrolle went 2s 9d better at 36s. Birmingham Sound Reproducers were in demand at 51s to show a gain of 2s 6d on the week, and Decca on further consideration of the report spun up another 1s 9d to 49s. But Reliance-Clifton Cables on the increase in the interim dividend from 6% to 8% jumped 1s 9d to 26s 6d. According to the chairman, present indications are that 1960 results will not fall substantially below those of 1959, and if earnings hold the company expects the current year to provide ample cover for an increase in the final dividend. Vactric Ordinary although up at one time to 8s 1½d on the possibility of an offer by Longford Electric once more weakened to 6s 3d, while Crabtree Electric came back further to 33s after 34s.—*From our City Correspondent.*

Sydney S. Bird and Sons

Warning that no dividend is likely for the current year has now been given by the directors. The company had a very adverse trading period for the first nine months of the year, resulting in a trading loss. Reorganisation has been carried out and by the end of September the position was stabilised and it is anticipated that the company will trade at a profit for the remainder of the year.

Burco Dean Ltd.

Dealings will probably start today in the £450,000 of 6½% unsecured loan stock 1980-85, all of which was subscribed for by Charterhouse Finance Corporation at £93, to which we referred on 15 Sept. A fair amount is expected to be available at £93½.

Calcutta Electric Supply Corpn.

An annual outlay of not less than £1¼ million on reinforcement of the transmission and distribution systems is anticipated over the next four years, Sir Harry Burn, chairman, tells shareholders. The board have deemed it advisable to appropriate £575,000 from the accounts for plant expansion and replacements. Capital expenditure in the year ended 31 March last amounted to £1,160,000. Although gross revenue in that year increased, the clear profit falls short of the reasonable return to which the company is entitled by £67,353, which has been made good by a similar transfer from special reserve.

East African Power and Lighting

Concerning our note on 11 Aug. on the acquisition by this concern of the Nyeri electricity undertaking, we should make it clear that the company only issued to the Government of Kenya £50,000 worth of unissued 7% preference shares and £150,000 of Ordinary stock. Mr A. J. Don Small, the chairman, also stated that minor valuations and the acquisition of stocks and stores were covered by an additional payment of some £21,000. There was no other cash payment.

Holophane Ltd.

An increase in the volume of business handled resulted in the improved trading profit figure despite the maintenance of stable prices for the company's products even though cost of materials and operating expenses continued to rise, the directors report. The value of orders outstanding has also increased and the level of overseas business has improved.

Year to 30 June	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1956	139,224	55,716	65	30	21/9	16/9
1957	143,615	56,399	65	37½*	16/1	11/1
1958	121,576	49,338	34	22½	15/10	12/7
1959	106,001	49,189	32	26	21/-	12/9
1960	113,537	52,771	34	30	22/3	16/1

* Plus 66⅔% capital bonus.

Perak River H-E Power Co.

The marked improvement in results followed the progressive relaxation of restrictions and, since 1 Oct. last, all restrictions on the export of tin have been removed. Mr H. G. Balfour, the chairman, reports that the company's monthly returns to date are running at a very satisfactory level and he anticipates results at least as good as for 1959-60 in the absence of adverse outside factors. In the year to 30 July last, the Chenderoh power station generated 170·8 million units—an increase of 20[illegible]—and the Malim Nawar steam stati[illegible] (where two new 12 MW sets were installed) supplied 180·6 million units, 97·8% more than in the previous year. The Batu Gajah station provided a further 35·1 million units. The company is examining the possibility of taking a bulk supply from the CEB of Malaya, and is also considering installing further generating plant at Malim Nawar. The subsidiary company, Kinta Electrical Distribution Co., which supplies 71 towns, villages and other centres, sold 19·3 million units, an increase of 5·45%.

Year to 31 July	£ Gross Revenue	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1956	1,618,470	287,910	20	10	17/6	13/7
1957	1,683,155	400,745	29	12½	18/3	13/3
1958	1,456,268	286,966	20	10	16/1	13/1
1959	1,044,202	70,161	2	5	18/1	12/3
1960	1,502,688	295,051	22	15	21/-	14/9

Parkinson Cowan Ltd.

Announcing an interim dividend of 5%, the directors warn that the final will be much influenced by the state of business next spring, but is likely to be lower than last year. Hire-purchase restrictions have severely reduced domestic appliance sales, but trading in the meter and instrument activities is better than last year, but not by a sufficient margin to offset a most disagreeable but it is believed only temporary reversal of fortune on the appliances side. The business of Bastian and Allen was recently acquired.

Reliance-Clifton Cables and Industrial Products

Announcing an increase in the interim dividend from 6% to 8%, the directors state that prices in the cable-making industry have now regained some measure of stability, but the level over a wide range of products remains uneconomic. The effect of smaller profit margins in the earlier part of the year is now being offset by increased output. They expect the results for the current year should not fall substantially below 1959, and if this estimate is fulfilled there would be ample cover for an increase in the final dividend (9% plus 5% capital profits distribution last time).

Dividends Declared

T. Clarke & Co. Interim 8% *(same).*

E. Green & Son. Interim 5% *(same),* but the chairman warns that production and profit will be appreciably below the 1959 figures.

Allen West & Co. Interim 5% *(same).*

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

28 Oct.—Manchester C.C. Electrical installation in smoke chamber, Central Fire Station.—See 20 Oct. issue.

29 Oct.—Dagenham B.C. Applications invited for inclusion in approved list of contractors for school maintenance electrical work.—See 20 Oct. issue.

29 Oct.—Heston and Isleworth B.C. Rewiring, supply and fixing of power outlets in: Contract 1, 92 houses; Contract 2, 102 houses; and Contract 3, 105 houses on Worple estate, Isleworth.—Advertised 13 Oct. issue.

31 Oct.—Dumfries B.C. Electrical installations in traditional houses, Lochside fifth development, section 7-93. Applications to Town Clerk, G. D. Grant, Municipal Chambers, by above date.

31 Oct.—Edinburgh. (d) Electrical installation, switchgear and distribution system; (e) lift installation in Dept. of Clinical Medicine and Medical Physics, Royal Infirmary. Secretary, S.E. Regional Hospital Board, Scotland, 11 Drumsheugh Gdns, Edinburgh 3. Applications by above date.

31 Oct.—Leighton Buzzard U.D.C. Erection of 28 Group "A" Stanton columns complete with lanterns/gear along A4012; resiting including the provision of new lanterns of 17 Group "B" columns and the erection of 33 additional Stanton columns/lanterns along Stanbridge Rd.—See 13 Oct. issue.

31 Oct.—Oldham C.B. Conversion of 15 mechanical public clocks to electric drive or electric wind.—Advertised 29 Sept. issue.

31 Oct.—Taunton B.C. Supply of (Item d) electrical goods for year.—See 20 Oct. issue.

31 Oct.—Warrington B.C. Contract 1. Supply and erection of submersible well pumps, horizontal centrifugal pumps, switchgear and hydraulic instruments for Houghton Green. Contract 2. Small horizontal centrifugal pumps, etc., for Risley Pumping Station.—See 20 Oct. issue.

31 Oct.—Wrexham B.C. (a) Electrical installations in 40 dwellings. Tanat Way and Sutton Drive; (b) supply of consumers' units and cabinets.—See 20 Oct. issue.

1 Nov.—Harrow B.C. Supply and installation of 120 200 W sodium units on 30 ft steel columns and removal of existing installation along Edgware Rd, A5.—Advertised 20 Oct. issue.

1 Nov.—North Down R.D.C. (a) Supply and erection of fluorescent street lighting in 15 villages.—See 20 Oct. issue.

1 Nov.—Watford B.C. Electrical installation, including embedded floor heating in 20 elderly persons' flats (one three storey block). Applications to Borough Engineer, Town Hall, by above date. Deposit £2 2s.—Advertised in this issue.

1 Nov.—Wombwell U.D.C. Supply of 250 3 cu ft 240 V refrigerators in quantities of not less than 50.—See 20 Oct. issue.

3 Nov.—Newcastle upon Tyne C.C. (1) Electrical installation in further extensions and alterations at Heaton Grammar and High Schools. Applications to City Architect, 18 Cloth Market, by above date.

3 Nov.—Sunderland B.C. Supply of gas and electric cooking equipment for Bede Grammar School. Central Purchasing Dept., Hylton Rd.

4 Nov.—Down C.C. All-electric lighting and heating installation in Child Health and Welfare Clinic, Knocknee Ave, Kilkeel.—See 13 Oct. issue.

4 Nov.—Dunbarton C.C. Supply of Gp "B" tubular steel columns. Applications to County Lighting Superintendent, W. Arthur, 24 George Sq, Glasgow C.2, by above date.

4 Nov.—Oldbury B.C. Erection, on fixed-price basis, of 88 Class "B" concrete columns, supply and fitting of post-top lanterns with lamps control gear/time switches, plus resiting of 26 units and conversion to M&F/U operation along various roads.—See 20 Oct. issue.

5 Nov.—Longbenton U.D.C. Supply and erection of 64 sodium units and 474 post-top lantern filament Group II street lighting units.—See 20 Oct. issue.

5 Nov.—Middlewich U.D.C. Fluorescent lighting installation in (part) Victoria Bldg, Lewin St.—See 20 Oct. issue.

5 Nov.—New Windsor B.C. Supply of (Item 15) lamps and (Item 21) fittings and cable for year to 31 Dec., 1961.—See 6 Oct. issue.

7 Nov.—Aldershot B.C. Supply and erection of Group "A" 25 ft steel columns with 140 W sodium lighting along Lower Farnham Rd and Group "B" 15 ft steel columns and 60 W sodium lighting along Church La West /Ayling Hill. Borough Engineer and Surveyor, Town Hall. Deposit £1 1s.

7 Nov.—Bath C.C. Supply of 200 Stanton 10F spun concrete columns. City Engineer, Guildhall.

7 Nov.—Belfast C.C. Electrical work in alterations and renovation at Falls Rd Public Baths. Details from architects, W. H. McAlister and Ptnrs, 6 Donegall Rd, Belfast 12. Deposit £3 3s.

7 Nov.—East Suffolk C.C. Street lighting included in Contract No. 36 for making up of 247 yd private road. County Surveyor, County Hall, Ipswich. Deposit £2 2s.

7 Nov.—Manchester C.C. Contract 323. Electrical installations: 12 flats, two shops and ten garages, Greenwood Rd. Director of Hsg, Town Hall, Manchester 2.—Advertised in this issue.

7 Nov.—Swanage U.D.C. Electrical installation in new depot at King's Rd West.—See 20 Oct. issue.

9 Nov.—Cheadle and Gatley U.D.C. Supply and erection of 30 Gp "A" pre-stressed concrete columns with 400 W mercury vapour lanterns in Bird Hall La. Engineer and Surveyor, Town Hall, Cheadle. Deposit £2 2s.

9 Nov.—Chelmsford B.C. (c) Electrical installation in new livestock market, Victoria Rd. Borough Engineer, Coval La. Deposit £2 2s.

10 Nov.—Derby B.C. Supply of 49 200 W sodium discharge units on 35 ft steel columns for A5111 Raynesway Trunk Rd lighting. Borough Engineer and Surveyor, Council Hse, Corpn St.—Advertised in this issue.

10 Nov.—Northwich R.D.C. Supply and installation of 40 Group "A" concrete columns with sodium lamps/lanterns/gear.—See 20 Oct. issue.

10 Nov.—Suffolk and Ipswich Fire Authority. Electrical work at Colchester Rd Fire Station. Applications to architects, Slater and Haward, 32 Foundation St, Ipswich, by above date.—Advertised in this issue.

11 Nov.—New Windsor. Electrical installations in two maisonnettes at Clewer New Town.—See 13 Oct. issue.

11 Nov.—Oldbury B.C. Erection, on fixed-price basis, of 20 Class "B" concrete columns, supply and fitting of post-top lanterns/lamps, control gear/time switches on Lion Farm estate.—See 20 Oct. issue.

11 Nov.—Wrexham B.C. Supply and erection, on fixed price basis, of ten 25 ft fluted steel columns/brackets and 140 W sodium vapour lanterns lamps for A483 (part) lighting. Borough Engineer and Surveyor, 31 Chester St.—Advertised in this issue.

14 Nov.—Malvern U.D.C. Erection of 151 concrete columns and lanterns plus provision of wiring lamps on seven new estates together with the removal of four gas lighting columns. Surveyor and Water Engineer, C. C. Judson, Council Hse. Deposit £2 2s.

14 Nov.—N.A.T.O. Infrastructure. Provision and proving of a very low-frequency radio-telegraph transmitting station in North of England.—Advertised 13 Oct. issue.

14 Nov.—West Riding C.C. Changeover from d.c. to a.c., by contractors on N.I.C.E.I.C. roll, at Beech Towers, Staincliffe, Dewsbury. Divisional Architect, Bishopgarth, Westfield Rd, Wakefield.

15 Nov.—Whaley Bridge U.D.C. Supply and erection complete of 16 Class "A" concrete columns with sodium lighting. Surveyor, Council Offices, Whaley Bridge, near Stockport.

16 Nov. Ipswich B.C. Electrical installation in proposed 56-person aged people's home, Chantry estate.—See 20 Oct. issue.

17 Nov.—Belfast C.C. Electrical installation in Assembly Hall, Dunkeld Gdns Model Secondary School for Girls. City Architect, 40 Academy St, Belfast 1.

17 Nov.—Birmingham C.C. Socket-outlet installations and lighting installation repairs in 250 houses at Acock's Green.—See 20 Oct. issue.

17 Nov.—Fylde Water Board. Supply of flow recorder panel and hydraulic measuring equipment.—Advertised 13 Oct. issue.

30 Nov.—Tottenham B.C. Supply of item 3, lamps for year from 1 April, 1961. Applications to Town Clerk, M. L. Taylor, Town Hall, N.15, by above date enclosing large (4½d) s.a.e.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 103 queries answered this week

Sunvic Controls Ltd.—address for? L.E.C.—Crown Hse, Aldwych, W.C.2.

"Whippet" drink mixers—makers of? C.O.M.—Howard Foss Ltd., Belvedere Wks, Totton, Southampton.

"Clix" accessories—makers of? T.E.—Associated Electrical Industries Ltd., 155 Charing Cross Rd, W.C.2.

J.P. Tubular heaters—address for spares? E.B.—Aurora Factory, Old Kilpatrick, Glasgow.

"Heddo" insulating tapes in P.V.C.—makers of? W.W.—Heddesco Ltd., Heddonia Hse, 374 Euston Rd, N.W.1.

"Hotlock" heated food trolleys—makers of? C.J.B.—Food Conveyors Ltd., 18 Manor Rd, North Hinchley Wood, Surrey.

"Runtact" busbar systems—makers of? G.L.—The Donovan Electrical Co. Ltd., 70-82 Granville St, Birmingham 1.

"Spiromic" heating elements—makers of? T.C.C.—A. and R. Electric Co Ltd., 1 Bruce Ave, Shepperton, Middx.

ANSWER WANTED

"Flux link" hermetically sealed, magnetically operated micro switches—makers of? E.E.L.

14 Dec.—Matlock U.D.C. Supply and installation complete of nine sewage pumps at four pumping stations in Darley Vale.—See 6 Oct. issue.

No date stated.—N. of Scotland H.E.B. 60 MVA transformer for Persley substation, Aberdeen.—Advertised 13 Oct. issue.

No date stated.—St. Faith's and Aylsham R.D.C. Supply of columns, lanterns, lamps and auxiliary equipment.—See 13 Oct. issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

7 Nov.—Australia. Four 500 kVA and two 1 MVA 16 kV/436 V transformers and two 750 kVA, 33 kV/436 V station transformers with fuse-switch attachments for Sydney South and Dapto substations. Commercial Manager and Secretary, E.C. of N.S.W., Box 5257, G.P.O., Sydney. B.o.T. (ESB/26808/60) and (ESB/26184/60).*

8 Nov.—New Zealand. (1) 150 MVA, 11 kV 3 ph. metal-clad switchgear comprising one incoming c.b. and three feeder c.b's. (2) Control, indicating and relaying equipment. One 5 MVA 33/11 kV 3 ph. transformer. Engineer-Manager, Franklin Electric Power Board, Private Bag, Pukekohe. B.o.T. (ESB/26432 and 3/60).*

9 Nov.—Iraq. Plastic insulated copper telephone cable (seven items), fixing nails, eyebolts and clamps. President, Central Foreign Purchasing Board, Ministry of Finance, Baghdad. B.o.T. (ESB/27129/60).*

15 Nov.—Canada. 1,700 steel transmission line structures. Purchasing Agent, A. C. Wigmore, Saskatchewan Power Corpn., 1739 Cornwall St, Regina. B.o.T. (ESB/26643/60).*

15 Nov.—Colombia. Nine 30 kW, 12 10 kW: one each of 100 and 200 kW diesel generators. Secretaria General de la Empresa Colombiana de Aerodromos, Calle 26 No. 14/41, Bogota. B.o.T. (ESB/26404/60).*

16 Nov.—Uruguay. Three items Neoprene or polyethylene insulated cable. Admin. General de las Usinas Electricas y los Telephonos del Estado, Montevideo. B.o.T. (ESB/27105/60).*

21 Nov.—Iraq. 30, 50 and 100 kVA transformers. Director of Contracts Section, Ministry of Defence Directorate of Contracts and Purchases, Baghdad. B.o.T. (ESB/27129/60).*

26 Nov.—Iran. 2,600 metres 6 kV cable. Purchasing Dept. (Tender Section), Ministry of Roads, Iranian State Railways, Tehran. B.o.T. (ESB/27802/60).*

30 Nov.—Iraq. 26 items. battery components. Ministry of Defence, Baghdad. B.o.T. (ESB/27128/60).*

2 Dec.—Australia. Two 30 MVA 3 ph. transformers. Town Clerk, Brisbane City Council, City Hall. B.o.T. (ESB/26962/60).*

5 Dec.—Australia. Control boards, communications desks and other control consolettes. E.C. of N.S.W., Box 5257, Sydney. B.o.T. (ESB/27670/60).*

7 Dec.—Sudan. One 7·5 kW 230 V d.c. generator. Controller of Stores, Sudan Railways, Atbara. B.o.T. (ESB/27676/60).*

5 Dec.—Iran. Power plant for Meshed including: boilers, generators, cooling equipment, turbine house crane, evaporators, station pipework, electrical equipment and cables and civil works. Meshed Electric Supply Co., Meshed. B.o.T. (ESB/27104/60).*

13 Dec.—Colombia. 30 MW power station near Tocancipa. Empresa de Energia Electrica de Bogota, Bogota. B.o.T. (ESB/26927/60).*

27 Dec.—Ceylon. Construction of 33 kV transmission lines. Electrical Engineer, Contracts and Supplies, McCallum Rd, Colombo. B.o.T. (ESB/26492/60).*

30 Dec.—India. One 150,000 lb/hr water tube boiler, 925 p.s.i. gauge at 925°F for Basin Bridge Power Station, Madras. Superintending Engineer, Technical (Electrical) Madras S.E.B., 157 Mount Rd, Madras. B.o.T. (ESB/27189/60).*

2 Jan.—India. 132 kV single circuit transmission line Jhansi/Kanpur. Superintending Engineer, Engineering Construction, Cerole 23-B, Vidhan Sabha Marg, Lucknow. B.o.T. (ESB/26484/60).*

4 Jan., 1961.—Costa Rica. Switches, lightning arresters, meters, insulators, cables, etc., for La Colima diesel station extension. La Proveeduria, Instituto Costarricense de Electricidad San Jose. B.o.T. (ESB/26624/60).*

5 Jan.—Costa Rica. One 10 MVA 3 ph. transformer. Institute Costarricense de Electricidad, San Jose. B.o.T. (ESB/27228/60).*

7 Jan.—United Arab Republic. Motors, pumps, generating sets and accessories for Euphrates/Aleppo water project. Director-General du Service des Eaux d'Alep, Syria. B.o.T. (ESB/27200/60).*

17 Jan.—Australia. Coloured telephones and components. Director, Stores and Contracts, P.M.G's. Department, 114 Russell St, Melbourne C.1. B.o.T. (ESB/26933/60).*

No date stated—India. Complete 300 MW atomic power station for Maharashta State. Project Administrator, Apollo Pier Rd, Bombay. 1. Tender notice with brief details from Engineering Branch, India Store Department, Government Bldg, Bromyard Ave, W.3. Reference S.3700/60/NSC/ENG.2.

CONTRACTS PLACED

Bolsover U.D.C. Supply and erection of 72 Gp "A" and 27 Gp "B" tubular steel columns/lanterns/gear, Abacus Municipal Ltd.

Chingford B.C. Erection of 201 Gp "B" units in 1960-61 street lighting scheme, Abacus Municipal Ltd.

C.E.G.B. Contracts placed during the past month amounting in the aggregate to £4,652,000 include: Thorpe Marsh power station: Aluminium wall cladding, Freeman Morrison Ltd.; structural steelwork for turbine house and boiler house for No. 2 unit set, Alex Findlay and Co. Ltd. Trawsfynydd nuclear power station: 275 kV and multicore cables and accessories, Pirelli-General Cable Works Ltd. Blyth "B" power station: Coal handling plant, Birtley Engineering Ltd. West Thurrock power station: Chimney for Nos. 3 and 4 boilers, Tileman and Co. Ltd., 3·3 kV switchgear extension for units Nos. 3 and 4, English Electric Co. Ltd. Bankside power station: One 136 MVA generator transformer, Associated Electrical Industries Ltd. Richborough power station: Structural steelwork for units 1 and 2, Dawnays Ltd. Barking "C" power station: 132 kV, 3,500 MVA switchgear, A. Reyrolle and Co. Ltd. Barking substation: Four 180 MVA, 275/132 kV transformers, Ferranti Ltd. Northfleet power station and substations: 132 kV, 3,500 MVA switchgear, English Electric Co. Ltd. Bustleholm substation: 275 kV and 132 kV switchgear, Associated Electrical Industries Ltd. Kingston-Chessington: 132 kV and auxiliary cables, British Insulated Callender's Cables Ltd. Iver-West Weybridge: 132 kV cables at London Airport, British Insulated Callender's Cables Ltd.

London C.C. Supply and installation of cables and miscellaneous works at Southern Outfall Wks, Erith. Johnson and Phillips Ltd., £202,317; L.E.B., £208,434; K.S. Construction Co., £211,765; B.I.C.C., £219,682; James Kilpatrick and Son Ltd., £228,315; A.E.I., £250,654. Lowest tender accepted.

Luton B.C. Electrical installation in Challney Secondary School extensions, H. C. Janes Ltd., £3,757.

Maidenhead B.C. Stage II street lighting scheme, Erecon Ltd., £2,270. Recommended.

Middlesbrough T.C. Electrical installation in new Thorntree Community Centre, C. Horne and Co. Ltd., £753 12s 6d.

Oadby U.D.C. Supply and erection of 31 Group "B" aluminium columns with 60 W sodium lighting along Leicester and London Rds, Midland Lighting and Bldg Ltd., £1,195.

Scunthorpe B.C. Electrical installations in 54 dwellings, Hobson and Scott Ltd., £1,424. Recommended.

Whickham-on-Tyne U.D.C. Provision of street lighting at Dunston, B. L. Oliver. Recommended.

TRADE NOTES

Changes of Address. The registered office of the Marconi International Marine Communication Co. Ltd. has been changed to Marconi Hse, Chelmsford.

Goodmarriott and Hursthouse Ltd. have transferred their works and offices to larger premises at Majestic Works, 700-708 Woodborough Rd, Nottingham. Telephone Nottingham 62291.

The Birmingham office of the Export Credit Guarantees Department has moved to Chamber of Commerce Hse, Harborne Rd.

New Branch. Negretti and Zambra Ltd. last week opened a branch at 38 Dean St, Newcastle upon Tyne.

New Telephone Numbers. With effect from 31 Oct., the telephone number of Turner Brothers Asbestos Co. Ltd., 14 Finsbury Circus, E.C.2, will be changed to London Wall 5471.

The telephone number of the Middlesbrough branch of British Insulated Callender's Cables Ltd. has been changed to Middlesbrough 43256.

Distributors. Winston Electronics Ltd. have appointed Hawnt and Co. Ltd., 112-114 Pritchett St, Birmingham 6, as their Midland distributors.

Extension. The extension of production area and office block at the Bush Fair, Haslow, works of Electrical Remote Control Co. Ltd. has been completed.

Agreement. An agreement has been signed between Elliott Brothers (London) Ltd. and F.X.R. Inc. of Woodside, New York, under which the two companies will make and sell in their respective territories each others range of microwave instruments. The Elliott territory includes the whole of the British Commonwealth, excluding Canada; that of F.X.R. the United States, its possessions overseas and Canada.

Change of Name. Vokes Ltd. has changed its name to Vokes Group Ltd., and a new subsidiary, Vokes Ltd., has been incorporated to take over the business trading as previously carried on.

Agreement. Londex Ltd., Anerley Works, 207 Anerley Rd, S.E.20, have concluded an agreement for the marketing of electromagnetic valves in the U.K. manufactured by Concordia G.m.b.H., Stuttgart.

Marketing Arrangement. Fothergill and Harvey Ltd. and Lantor Ltd. have concluded an arrangement whereby the first-named will sell Lantor products for industrial uses.

Acquisition. Aerialite Ltd. have acquired the manufacturing and distribution rights of the "Casian Trav-ler" tape recorder.

Expansion. John Baggs Ltd. have been formed to take over the business hitherto carried on as a partnership at Uppermill, near Oldham, as John Baggs and Co. The firm have also moved to new and larger premises at Relay Works, Hollins Rd, Oldham. Telephone Failsworth 3785.

BUSINESS PROSPECTS

Abingdon, Berks. R.D.C. Tender: 22 detached houses on Cumnor housing estate. Surveyor, Council Offices, 60 Bath St.

Alnwick. Hardy Bros. (Alnwick) plan new premises.

Ayr. British Replin, 20 Belvedere Terr, Ayr, plan factory and offices in Heathfield Rd covering 50,000 sq ft.

Basingstoke. Wilkinson Sword, Southfield Rd, W.1., plan possession of six-acre site.—Associated Transistors Ltd. plan factory on 17½-acre site. Mental Health training centre and hostel planned at St. Michael's Rd, South Ham. Hampshire County Architect, Winchester.

Billingham-on-Tees. U.D.C. plans 300 Radburn housing site units. Surveyor.

Bingham R.D.C. Tender: Three houses and 11 bungalows. Architects Wm. Saunders and Ptnrs., 24 Castle Gate, Newark-on-Trent, Notts.

Birmingham. Industrial developments planned: Bissell St for C. E. Rossiter and Co., 227 Moseley Rd; Bissell St for Sturge and Co., 37 Sheepcote St; Bissell St for Birmingham Tempered Spring and Presswork Co., 101 Irving St; Buckingham St for Rodway and Taylor (Birmingham); Howard St, Barr St and Smith St for A. E. Clark and Co. (Tools), 83 Snow Hill.—Tenders: Contract No. 691: 13 one- and two-storey dwellings, Northfield; No. 695: 10 shops and dwellings, Erdington; No. 711: three shops and dwellings, Warstock; No. 718: eight four-storey dwellings, Pool Farm estate; No. 725: 11 two-storey dwellings, Bartley Green. Architect.—Holland W. Hobbis and Ptnrs., 36 Waterloo St, architects for £350,000 Edgbaston High School for Girls, Westbourne Rd.

Bishop Auckland. Matthew C. Robson and Son, 245 Newgate St, architects for Foster and Sons' tinplate factory.

Bournemouth. Orbar Holdings plan shops, offices, showrooms and warehouses at 130/138 Holdenhurst Rd.

Bowden. Manchester Hospital Board, Cheetwood Rd, approve scheme for alterations at Southfield Maternity Hospital and Littlethorpe.

Bromley B.C. Tender: 104 flats Turpington La. Engineer.

Canterbury T.C. Tender: 29 accommodation units Artillery St and Military Rd. Architect.

Cardiff. E. Turner and Sons, Penarth Rd contractors for £76,600 offices for Royal-Globe Insurance Group.

Carlisle. A. F. Sewell, 1 Warwick Rd, architect for Milbourne St office block for Border Engineering Contractors.

Carmarthen. Architects' Co-Partnership, 44 Charlotte St, W.1, architects for £32,000 extensions at Trinity College for Church Training College.

Chelmsford. R. C. Harrison, White Roding, Dunmow, Essex, architect for factory and offices at Beach's Drive for Windley Bros.—Stanley Bragg and Associates, 121 New London Rd, architects for six-storey office block at 77 Springfield Rd for Dr. R. W. Willcocks.—Stanley Keen, 9 The Mews, Roding La, South Ilford, architect for showrooms and office building, 44 Broomfield Rd for Pollards.

Chesham. Fuller, Hall and Foulsham, 212 High Holborn, W.C.1, architects for Metchair's planned factory.

Chesterfield R.C. Authorities plan three primary schools and extensions to St. Mary's, Cross St.

Chester-le-Street. C. Solomon, 30 St Mary's Pl, Newcastle, architect for shops, offices, etc., at North Burn.

Chichester. Robert Marriott, Midland Wks, Rushden, Northants, contractors for £276,000 extensions to Bishop Otter College for Council of Church Training Colleges.

Croydon. A. Minoprio, 18 Seymour St, W.1, architect for offices, shops, restaurant on site of Trinity School of John Whitgift, North End, for Whitgift Foundation.

Darlington. Fennell and Baddiley, Bridge End Chbs, Chester-le-Street, architects for 20,000 sq ft extensions to Underground Mining Machinery's Aycliffe Estate factory.

Essex. Welfare Committee approves £47,150 estate for Manor Home extensions.

Eston. N. C. Harrison, 246 Normanby Rd, South Bank-on-Tees, surveyor for U.D.C.'s 60 old peoples' flatlets.

Gillingham B.C. Tender: 20 houses as Stage three of Stratford estate. Engineer.

Glasgow. Ingersoll-Rand Co., 165 Queen Victoria St, E.C.4, plan factory at Dalmuir, Clyde-Bank.—Lynn Proofing Co., plan extensions to 356 Amulree St, E.2 works.—H. J. Stuart (Glasgow) plan extensions to 24 Acorn St factory.

Guildford. Roffey, Adamson and Ptnrs., Cumberland Hse, Kensington Court, W.8, architects for Yokes of Guildford's factory extensions, Henley Park.

Harrow. Deacon and Laing, 65 Goldington Rd, Bedford, architects for extensions to Sopers of Harrow's Station Rd store.

Hays. H. O. Luder, 79 Regency St, W.1, architect for E. Alec Colman Group's seven shops with maisonnettes, 15 flats, etc., on site of Essoldo Cinema.

Hemel Hempstead. H. G. Cherry and Ptnrs, 38 Gordon Sq, W.C.1, architects for £242,000 Crabtree La girls' school.

Hucknall U.D.C. Tender: 150 houses and flats Welbeck housing estate. Engineer.

Lackenby. Dorman, Long have £36 million modernisation scheme the greater part of which will be sited at Lackenby.

Leicester. Imperial Typewriter Co., Leicester, plan £100,000 premises, Copdale Rd.

Liverpool. Arndale Property Co., Howard Hse, Bank St, Bradford 1, plan development of Woolton St sites.

London. A. W. Pipe and Son, 8 Queen St, E.C.1, architects for Associated Lead Manufacturers planned new building, West Ferry Rd, E.14.—Anchor Glass Co., Brent Cross Wks, North Circular Rd, plan extensions.—Elliott, Cox and Ptnrs., 172 Buckingham Palace Rd, S.W.1, architects for laboratory at Hendon Way for Johnsons of Hendon Ltd.—Radiation Ltd. plan research laboratories at 255 North Circular Rd, N.W.10.—Medical Research Council, 38 Old Queen St, S.W.1 plans polio research centre, National Institute for Medical Research, The Ridgeway, N.W.7.—Victor Heal and Ptnrs., 14 Gray's Inn Sq, W.C.1, architects for six-storey offices Warwick La, E.C.4, at junction with Warwick Sq.—Colbeck and Ptnrs., Palmerston Hse, Bishopsgate, E.C.2, architects for rebuilding of 27-38 St. Clements La, E.C.—Hammerson Property and Investment Trust plans rebuilding of parts of Coleman St and Basinghall St, E.C.2.—L. R. Kinsler and Ptnrs., 28 Berkeley Sq, W.1, quantity surveyors for Caxton St, S.W.1 office buildings.—Plans submitted to St. Pancras B.C. for shops, showrooms, offices at Windmill St, Tottenham Court Rd and Percy St, shops and offices at Camden High St, shops and showrooms at Euston Rd, etc.—12-storey building planned at 252-280 Euston Rd.—Shaw and Lloyd, 74 Gt Russell St, W.C.1, architects for rebuilding of French Railway's Piccadilly offices.—W. J. Bonfield, 46 Queen Anne St, W.1, architects for nine-storey Lower Sloane St, S.W.1 building.

Macclesfield. Manchester Hospital Board, Cheetwood Rd, Manchester plan 42-bed maternity unit, West Park.

Maidstone. Factory Holdings Group, 36 Wigmore St, W.1, plan Park Wood Trading Estate factory.

Manchester T.C. Tender: Contract 301/351 Councillor La, Cheadle dwellings and Contract 332/341, 144 dwellings Wythenshawe. Director of Housing.—Tender: Traffic and baggage wings, customs and restaurant wing and flights wings, piers, etc, at new terminal building, Manchester Airport. Architect.

Middlesbrough. J. G .D. Poulson, 54 Albert Rd, architect for Jordinson and Co.'s Longlands Rd printing works.—P. A. Mudd and Lionweld plan extension scheme for 204 ft by 40 ft building for plant, workshop, etc.—St. Stevenson Jones, Harley Buildings, Old Hall St, Liverpool, architect for Kirkham Row, Beechwood R.C. Church and Hall.—T.C. plans £54,200 street lighting programme. Engineer authorised to place £6,145 of orders for supply of 440 lighting columns.

Newcastle T.C. 180 flats in two 15-storey blocks planned for Longbenton housing site. City Architect.

Nottingham T.C. Tender: 150 houses, 54 flats and 10 bungalows Bestwood Pk estate. Estate Surveyor and Valuer, W. E. S. Martin, The Guildhall.

Northumberland C.C. Tender: three practical rooms and classroom at Walbottle Campus site. County Architect.

N Riding C.C. Johns, Slater and Haward, 32 Foundation St, Ipswich, architects for Stage 2 of Thornaby Grange County School.

Oxford. Mansfield College plans three-storey students' residential block.—University Chest plans eight-storey block of teaching and research laboratories for biochemistry department at South Parks Rd. Cost: £400,000.—New buildings to cost £68,000 planned at Department of Catering and Hotel Management, Oxford College of Technology.

Oxfordshire. £836,390 development project planned at Bordcourt Hospital, Peppard. Regional Hospital Board, Banbury Rd approves.

Paisley. S. Lothian Barclay and Jarvis, 19 Woodside Pl, Glasgow C.3, architects for whisky plant and offices for Chivas Bros.

Petworth R.D.C. Tender: Eight flats, Kirkford and 12 flats Luffs Meadow, Northchapel. Clerk.

Plymouth. Corporation plans three new clinics and community mental health centre at Seven Trees site at £64,830.

Portsmouth. Land and Commercial Holdings plan factory and offices at Fitzherbert Rd, Farlington.—Collis and Co., Cosham, plan warehouse and offices, Portsmouth Rd.

Prudhoe. Ambulance depot at West Wylam planned by C.C. County Architect.

Reading. Greenslade and Co. (Reading), Kings Bridge, plan Commercial Rd factory.—Southern Gas Board, 4 Gasworks Rd, plan industrial development on King's Meadow land.

Rugby. Willow Engineering (Rugby), Willow La, plan rebuilding of factory.—English Electric plan extension to Willans Wks, Newbold Rd, research laboratory.

Sleaford, Lincs. MacAuslan, Abbott and Ptnrs, 3 Smithfield St, Liverpool 3, recommended consulting engineers for electrical services and a.c./d.c. changeover at Rauceby Hospital.

Staines. Dyneley, Luker and Moore, 1 Lincoln's Inn Fields, W.C.2, architects for Petters Ltd. research building at The Causeway.

Stockton-on-Tees. 36 bungalows Rochester Rd planned. Borough Architect (T. C. Hartley), 28 The Square, Stockton.

Sunderland. Students' union and hostel block planned South Johnson St. Borough architect.—Newcastle Hospital Board, Benfield Rd, Newcastle, plan £7,000 additions to Royal Infirmary pathological dept.

Swindon. Holland & Hannen and Cubitts (Gt. Britain), 1 Queen Anne's Gate, S.W.1, contractors for The Pressed Steel Company's £3½ million production plant at Stratton St. Mary.

Tottenham B.C. Tender: 16 Braemar Rd dwellings. Engineer.

Walton-on-Thames. S.W. Metropolitan Hospital Board, Eastbourne Terr, W.2, plan convalescent home, Queen's Rd, at £100,000.

Business Prospects—Continued

Wallasey B.C. plans health clinic at Twickenham Drive. Architect.

Wallsend-on-Tyne. S. W. Milburn and Ptnrs., 9 Esplanade, Sunderland, architects for George Angus and Co.'s planned Coast Rd factory extensions.

West Bromwich. Copper and Alloys plan extensions at Greets Green Rd.—Robinson Bros. plan warehouse and three process buildings at Phoenix St.—Charles (Wednesbury) Ltd., plan offices, etc., at Holloway Bank.

West Dean R.D.C. Tender: 26,000 super ft, Tufton Ave, Coleford, industrial bldg and offices. Engineer and Surveyor, Coleford.

West Riding C.C. £19,375 Park La Primary School extensions and new primary schools at Kirk Sandall and Bentley plus new secondary school at Bentley proposed.

Wiltshire. Tidworth Down County Secondary School as £109,452 addition to M.E.'s 1961-2 programme.

Wirksworth. John Bowmer and Son plan new factory at Water La.

Worcester C.C. Tender: 171 Wardon estate dwellings. City Engineer, 22 Bridge St.—Tender: Bromsgrove Ruberg infants' school and clinic. Architect, 14 Castle St.

Workington T.C. 200 houses planned.

York T.C. Tender: 30 Long Close La flats. Architect.

Gazette Announcements

COMPANIES ACTS

West Lancashire Electronic Products Ltd. Creditors to send details to liquidator: C. Mead, 55 Hoghton St, Southport, by 8 Nov.

Domestic Electric (Kent) Ltd. Mr C. Goodwin, Trevone, Ash, Sevenoaks, Kent, appointed liquidator at extraordinary general meeting on 1 Oct. for the purpose of winding-up.

G. Norton and Co. Ltd. Mr R. A. Haigh, Court Chmbrs, Friar La, Leicester, appointed liquidator at extraordinary general meeting on 10 Oct. for the purpose of voluntarily winding-up.

Ferris Domestic Appliances Ltd. Petition for winding-up to be heard before the High Court of Justice on 31 Oct. Persons intending to appear to notify Kimbers, 34 Nicholas La, E.C.4, by 29 Oct.

Renteasie Ltd. Mr R. A. Hawken, Bank Chmbrs, 1 John St, W.C.1, appointed liquidator at extraordinary general meeting on 11 Oct. for the purpose of voluntarily winding-up.

Mau-bit Distributors Ltd. Mr R. A. Hawken, Bank Chmbrs, 1 John St, W.C.1, appointed liquidator at extraordinary general meeting on 11 Oct. for the purpose of voluntarily winding-up.

L. P. Tibbitts Ltd. and **L. P. Tibbitts (Radio and Television) Ltd.** Mr R. A. Hawken, Bank Chmbrs, 1 John St, W.C.1, appointed liquidator at extraordinary general meeting on 11 Oct. for the purpose of voluntarily winding-up.

Astoria Electrics Ltd. Meeting of creditors to be held at 29a New Cavendish St, W.1, on 14 Nov., at 11 a.m.

Derwent Exports (London) Ltd. Last day for receiving proofs for intended dividend: 31 Oct., to be sent to liquidator: H. W. Pitt, 100 Park St, W.1.

D.E.S. (Sewing Machines) Ltd. Last day for receiving proofs for intended dividend: 29 Oct., to be sent to liquidator: F. M. Collins, Inveresk Hse, 346 Strand, W.C.2.

Gayer and Cresswell (Manchester) Ltd. Mr H. S. Stafford, 61 Brown St, Manchester 2, appointed liquidator at extraordinary general meeting on 13 Oct.

Progressive Eng. Co. (1929) Ltd. Mr F. A. Blake, 19 Fenchurch St, E.C.3, appointed liquidator at extraordinary general meeting on 14 Oct.

Barbados Electric Supply Corpn. Ltd. Mr J. R. M. Valentine, 3 London Wall Bldgs, E.C.2, appointed liquidator at extraordinary general meeting on 14 Oct. Creditors to send details to liquidator by 25 Nov. Formal notice: all creditors to be paid in full.

Garjohn Electrics Ltd. Mr J. F. Johnsen, 8 Bellevue Rd, Southampton, appointed liquidator as from 29 Sept.

Tungsten Mnfg. Co. Ltd. General meeting of members and creditors to be held at 19 Eastcheap, E.C.3, on 28 Oct., at 11.30 a.m. and 12 noon, respectively, for the purpose of receiving an account of the winding-up.

BANKRUPTCY ACTS

First Meeting and Public Examinations

Slough. R. G. Daniels, electrical retailer, carrying on business as Hayden Television at 51-53 Oxford Rd, Windsor. First meeting: 11.30 a.m., 28 Oct., at 58-61 York Terr, Regent's Pk, N.W.1; and public examination: 11.30 a.m., 14 Dec., at Law Courts, Windsor Rd, Slough.

Blackpool. G. T. Smethurst, electrical dealer, formerly carrying on business in partnership as S. Gee and Co., 178 Watson Rd, Blackpool. Public examination: 10.30 a.m., 9 Nov., at Court Hse, South King St, Blackpool.

Cardiff. R. P. Harris, electrician, of 68 Paget St, Grangetown. Public examination: 10.30 a.m., 2 Dec., at County Court, County Court Bldgs, Westgate St, Cardiff.

Blackwood, Tredegar. P. Talbot, radio, television and electrical goods retailer, carrying on business at 100 Bailey St, Brynmawr, Brecon, and 19 Somerset St, Abertillery. Public examination: 11.30 a.m., 6 Dec., at County Court, Blackwood Rd, Blackwood, Mon.

Appointment of Trustees

Barnstaple. G. H. Cornwell, electrical retailer, formerly carrying on business as "Tele-Speed," at 21 Rockmount, Pitt La, Bideford. Mr J. E. Ellis, 50 The Terrace, Torquay, appointed trustee as from 30 Sept.

Blackwood, Tredegar. P. Talbot, radio, television and electrical goods retailer, carrying on business at 100 Bailey St, Brynmawr, Brecon, and 19 Somerset St, Abertillery. Mr G. H. Down, 106 Walter Rd, Swansea, appointed trustee as from 12 Oct.

Dividend

Bradford. K. M. Ashworth and D. Revell, electrical contractors, carrying on business as Ashworth and Revell at 265 Bradford Rd, Frizinghall, and 120 Otley Rd, Shipley. Separate estate of D. Revell dividend per £: 2s 6¼d, payable at Official Receiver's Office, 20 North Parade, Bradford 1, on 27 Oct.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Andard-Mount Co. Ltd., 82 Portland Pl, W.1. Manufacturers of and dealers in general electrical equipment, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: David W. Grey and David Wade.

Belclere Co. Ltd. To acquire the business, assets and undertaking of that department of Savory and Moore Ltd. which is concerned with the distribution of acoustic appliances, electrical transformers, etc. Nom. cap.: £5,000. Dirs.: not named. Subs.: George Conrad and John R. Hamer-Harries, 11 Old Jewry, E.C.2.

Brewer and Phillips Ltd., 66 Regent St, Plymouth, Devon. Electrical engineers and contractors, manufacturers of and dealers in radio and television apparatus, etc. Nom. cap.: £5,000. Dirs.: John F. Hurford, Mildred A. Edmunds and Wm. L. Long.

Charles R. Barker Ltd., 18-19 Southgate St, Bishop Auckland. To take over business of an electrical and mechanical engineer carried on at Bishop Auckland by Charles R. Barker, etc. Nom. cap.: £1,000. Permanent dirs.: Charles R. Barker and Daisy M. Barker.

Deimos Ltd., 8 Corwell La, Hillingdon, Middx. Electronic and automation engineers, etc. Nom. cap.: £100. Dir.: John C. Latham.

Edison Gill Co. Ltd., Bayton Rd, Exhall, Warwicks. To carry on business of electrical equipment specialists, etc. Nom. cap.: £100. Dirs.: Harry L. Gill and Lilian E. Gill.

Electro Scientific Ltd., Alexander St, Chesham, Bucks. Manufacturers of and dealers in electronic tubes, valves, etc. Nom. cap.: £500. Dirs.: Leslie F. Mitchell and Mrs Helen E. Mitchell.

General Steel Wares Ltd. British address: Regina Hse, 259 Marylebone Rd, N.W.1. Registered in Canada in October, 1927, to carry on business of manufacturers of and dealers in metals, brass finishers, etc. Capital: 69,062 5% cum. preferred shares of $100, and 1,000,000 common shares without nominal or par value. Name of person authorised to accept service: Ronald T. Williams.

J. D. Henderson Ltd., 35 New Broad St, E.C.2. Electrical engineers, etc. Nom. cap.: £1.000. Dirs.: Jack D. Henderson and Jack Walton.

Hounslow Heath Electrical Ltd. Nom. cap.: £100. Buyers and sellers of, dealers in and manufacturers of electrical and electronic apparatus, etc. Dirs.: Mrs Rosemary S. Bailey, 12 Stratton Rd, Sunbury-on-Thames, and James Bailey, 381 Staines Rd, Hounslow, Middx.

Houston and Bramley Ltd., Avenue Wks, Starbeck, Harrogate. Manufacturers of and dealers in electrical equipment, etc. Nom. cap.: £100. Dirs.: Donald B. Houston and Joseph R. Bramley.

Inflex Ltd., 3 Gray's Inn Sq, W.C.1. Mechanical, electrical, precision and general engineers, etc. Nom. cap.: £100. Dirs.: Tibor Funk, Maurice Pryce and Louis R. Vaughan.

Marshalls (Electrical Engineers) Ltd., 266-70 Bethnal Green Rd, E.2. Nom. cap.: £100. Dirs.: Moss Shalet, Mrs Esther Shalet, Mark Westbrook and Mrs Shirley E. Westbrook.

Norel Electrical Appliances Ltd., 26 High St, S.W.19. Nom. cap.: £1,000. Dirs.: Michael S. Thompson and Ignacy J. Koziel.

R. and L. Paul (Kenton) Ltd., 42 Mount Pleasant, Wembley. Electrical engineers and contractors, etc. Nom. cap.: £100. Dirs.: Paul F. F. Eycken, Olive L. Eycken and Alan Hill.

Rank Cintel Ltd. Manufacturers of and dealers in electronic devices, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Alan Peterson and David Preston, 11 Waterloo Pl, S.W.1.

Street Lighting Ltd., 100 North Sherwood St, Nottingham. Manufacturers of and dealers in street lighting equipment, etc. Nom. cap.: £100. Dirs.: Ralph Lowe and Geoffrey F. G. King.

Teleskill Ltd., 43 Upper Berkeley St, W.1. Manufacturers of and dealers in electrical goods of all kinds, etc. Nom. cap.: £100. Dirs.: Cyril G. Schilling and Delia M. Banks.

W. Thatcher (Electrical Contractors) Ltd., 144-6 Desborough Rd, High Wycombe, Bucks. Nom. cap.: £1,000. Dirs.: William H. Thatcher and Marjorie J. Thatcher.

Warden Electrics Ltd., 130 Monument Rd, Ladywood, Birmingham 16. To take over the business carried on by Alfred L. Warden at Ladywood, Birmingham, etc. Nom. cap.: £100. Dirs.: Alfred L. Warden and Sylvia Newman.

John B. Woodward (Electricians) Ltd., 176 Cherry Orchard Rd, Handsworth Wood, Birmingham 20. Nom. cap.: £5,000. Dirs.: John B. Woodward and Dennis M. Davy.

MEETINGS TO NOTE

THURSDAY, 27 OCT.

I.E.E. "The Principles and Operation of Large Radio Telescopes," A. Hewish, Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (S. Midlands). "Some Aspects of Engineering in Polar Regions," D. L. Pratt. Midland Institute, Birmingham. 6.30 p.m.

I.E.E. (Southern Graduates and Students). "Gramophone Pickups for Stereo and Mono Reproducers," D. J. Edwards. Technical College, Brighton. 6.30 p.m.

I.E.E. (N. Scotland). Sub-centre chairman's address, L. F. Dorward. Electrical Engineering Department, Queens College, Dundee. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Chester). "Analogue Computers," W. E. Willison. Lecture Theatre, Administrative Building, The Associated Ethyl Co. Ltd., Oil Sites Rd, Ellesmere Port, Wirral. 7 p.m.

A.S.E.E. (E. and W. Kent). Dinner. Star Hotel, Maidstone.

A.S.E.E. (S. London). "Industrial Applications of Isotopes," T. B. Rowly. Greyhound Hotel, High St, Croydon. 8 p.m.

A.S.E.E. (N. Ireland). "Protection Equipment for Industrial Plant," Dr W. L. Stern. Central Hall, Rosemary St, Belfast.

A.S.E.E. (Oxford and Districts). "Interference Suppression in Industrial and Research Establishments," A. C. F. Leadbitter. Reactor School, Harwell. 5.45 p.m.

FRIDAY, 28 OCT.

I.E.E. (N. Scotland). Sub-centre chairman's address, L. F. Dorward. Robert Gordon's Technical College, Aberdeen. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Scottish). "Instrumentation of a Steel Strip Mill," H. Gill. Building Centre, Sauchiehall St, Glasgow. 7.15 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Cheltenham). "The Atomic Clock," L. Essex. Belle Vue Hotel. 7.30 p.m.

A.S.E.E. (Coventry and District). "Technical Education for the Electrical Engineer," M. M. Robins. E.M.E.B. Sports and Social Club, Merrick Lodge, Sandy Lane. 8 p.m.

SATURDAY, 29 OCT.

A.S.E.E. (Bradford and District). Dinner, Gt. Northern Hotel, Bridge St. 7.30 p.m.

MONDAY, 31 OCT.

I.E.E. (E. Anglia). "Modern Coal-fired Power Stations," A. E. Hawkins. Assembly Hse, Norwich. 7.30 p.m.

I.E.E. (Mersey and N. Wales). "The Application of Irradiation in Industry," M. C. Crowley-Milling. Royal Institution, Colquitt St, Liverpool. 6.30 p.m.

I.E.E. (N.E. Measurement and Electronics Group). "New Amplifying Techniques," Prof C. W. Oatley. Rutherford College of Technology, Newcastle. 6.15 p.m.

I.E.E. (Malvern Group). A.G.M. and "Applications of Microwaves," Prof A. L. Cullen. Winter Gdns, Gt. Malvern. 7 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Applied Mechanics and Lubrication Groups). Discussion: 'Roller Bearing Problems—Is There a Need for Fundamental Research?" Birdcage Walk, S.W.1. 6 p.m.

I.E.S. (Leeds). "Ship Lighting—Perils and Prospects for the Lighting Engineer," J. T. Grundy and G. H. Vaughan. Institute of Technology, Bradford. 7 p.m.

TUESDAY, 1 NOV.

I.E.E. (Measurement and Control Section). "Transistor Instrumentation in Rockets," G. G. Haigh. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (N. Eastern). "The Impulse Strength of Impregnated-Paper Dielectrics as Used in High-Voltage Cables," B. Salvage and J. A. M. Gibbons. Workington College of Further Education. 7 p.m.

I.E.E. (N.W. Utilisation Group). "Factories Act—Electricity Regulations," S. J. Emerson. Engineers' Club, Manchester. 6.15 p.m.

I.E.E. (N. Midlands). "A New Form of Crane-Hoist Control Using a 3:1 Pole Changing Induction Motor," O. I. Butler and V. Ahmad. Leeds and County Conservative Club, South Parade, Leeds. 6.30 p.m.

I.E.E. (S.E. Scotland). "Engineering and Civilisation," Sir Hugh Beaver. Carlton Hotel, North Bridge, Edinburgh. 7 p.m.

I.E.E. (Rugby Graduates and Students). "The Mercury Arc Converter and its Applications," P. Richardson. College of Engineering Technology. 6.30 p.m.

INSTITUTION OF PLANT ENGINEERS. "Municipal Engineering Services," A. F. Holt. At R.S.A., John Adam St, Adelphi, Strand, W.C.2. 7 p.m.

A.S.E.E. (S.E. London). "Electric Floor-warming," D. W. Ackery. Eltham Green School, Queenscroft Rd, S.E.9. 7.45 p.m.

A.S.E.E. (W. London). "Silicone Rectifiers," D. R. Coleman. Windsor Castle Hotel, 134 King St, W.6. 7.45 p.m.

A.S.E.E. (Reading and Districts). "High-frequency Heating and Plastic Welding," W. D. Wilkinson. Marquis of Lorne, Friar St. 7.30 p.m.

WEDNESDAY, 2 NOV.

I.E.E. (Electronics and Communications Section). "The Ionosphere—A Review of Recent Progress," Professor W. J. G. Beynon. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (Southern). "The Electrical Simulation of Heat Flow in the Analysis of Cooling Systems for Electrical Equipment," B. M. Weedy. The University, Southampton. 7 p.m.

I.E.E. (Tees-side). "Some Considerations in the Application of Power Rectifiers and Convertors," J. P. McBreen. Cleveland Scientific and Technical Institution, Middlesbrough. 6.30 p.m.

A.S.E.E. (N. London). "Applications of Ball and Roller Bearings," A. Hill. Wood Green Civic Centre, Town Hall, N.22. 8 p.m.

A.S.E.E. (Manchester). "Recent Developments and Applications Involving the Use of Semiconductors." Engineers' Club, Albert Sq. 7.15 p.m.

A.S.E.E. (Preston). "Electric Motors in Agriculture," J. B. Abbott. R.A.F.A. Club, East View. 7.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Radar Group). Discussion: "Radar—Pulse or C.W.?" London School of Hygiene and Tropical Medicine, Keppel St, W.C.1. 6.30 p.m.

I.E.S. (Edinburgh). "Lighting for Photography," R. W. Unwin. Y.M.C.A. Social Room, 14 South St. Andrew St. 6.15 p.m.

I.E.S. (Newcastle). "Ship Lighting," J. T. Grundy. Room B7, The Percy Bldg, King's College, Queen Victoria Rd. 6.15 p.m.

I.E.S. (Swansea). "Industrial Lighting." Demonstration Theatre, S.W.E.B., Kingsway, Swansea. 6 p.m.

THURSDAY, 3 NOV.

I.E.E. (Joint meeting with Civils and Mechanicals). "The Training of Overseas Graduate Engineers, with Particular Reference to the F.B.I. Scholarships Scheme," W. Abbott. Savoy Pl, W.C.2. 5.30 p.m.

A.S.E.E. (Brighton, Hove). "Electrification of the Railways," T. R. Humes. New Imperial Hotel, First Ave, Hove. 7.30 p.m.

CHELMSFORD ENGINEERING SOCIETY. "Features in the Design and Construction of Heavy Machine Tools," J. H. Rivers. Hoffmann's Social Hall. 7.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (S. Midlands). "Electronic Sector Scanning," Prof D. G. Tucker. Winter Gdns, Malvern. 7 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (N. Western). "Video-tape Recording," P. Denby. Reynolds Hall, College of Technology, Manchester 1. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (E. Midlands). "Instrumentation in Biophysics," F. A. Glover. College of Further Education, Greenclose La, Loughborough. 7.15 p.m.

I.E.S. (Birmingham). Ladies' Night. Botanical Gdns, Edgbaston. 7.30 p.m.

I.E.S. (Glasgow). "Lighting for Ships," J. T. Grundy. Joint meeting with Institution of Engineers and Shipbuilders in Scotland. Weir Hall, 39 Elmbank Cres. 6.30 p.m.

I.E.S. (Nottingham). "Horticultural Lighting," A. W. Gray. Electricity Centre, Carrington St. 6 p.m.

FRIDAY, 4 NOV.

I.E.E. (Medical Electronics Group). Discussion: "Electro-Convulsive Therapy." Savoy Pl, W.C.2. 6 p.m.

I.E.E. (N.E. Graduates and Students). "Aspects of Large Thermal Power Station Construction, Operation and Management," R. Lott. Grey Hall, King's College, Newcastle. 6.30 p.m.

A.S.E.E. (Liverpool). "Industrial Lighting." J. D. Ducker. Industrial Development Centre, M.A.N.W.E.B., Paradise St. 7.30 p.m.

A.S.E.E. (Stoke and Crewe). "The Development of Plastic Insulated Mains Cables, Jointing and Terminating," D. H. Booth. Royal Hotel, Crewe. 7.30 p.m.

A.S.E.E. (Wolverhampton and District). Dinner/dance at Star and Garter Hotel, Victoria St. 7.30 p.m.

N.E. ELECTRICAL CLUB ANNUAL DINNER, County Hotel, Newcastle upon Tyne.

INSTITUTION OF PLANT ENGINEERS (Kent). Branch Annual Dinner and Dance at Central Hotel, Gillingham.

A.P.L.E. (S. Western). Induction of chairman, followed by "Public Lighting Plan for Weston-super-Mare," J. R. Freer-Hewish, and "The Electricity Board's Part in Public Lighting," H. G. B. Dickinson. Town Hall, Weston-super-Mare. 2.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Fawley). "Automation in the Post Office," W. S. Roddis. Admin. Bldg, Esso Refinery. 5.30 p.m.

SATURDAY, 5 NOV.

I.E.E., MECHANICALS AND CIVILS (London Graduates and Students). Joint dance. Carlton Rooms, Maida Vale, W.9. 7 p.m.

MONDAY, 7 NOV.

I.E.E. Discussion: "The Impact of Television on Society." Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (N. Eastern). "Water-Turbine Driven Induction Generators," C. L. C. Allan. Neville Hall, Westgate Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (S. Midlands). "A Survey of Street Lighting and Its Future," W. R. Stevens and H. M. Ferguson. James Watt Memorial Institute, Birmingham. 6.30 p.m.

I.E.E. (Scottish Electronics and Measurement Group). "Advances in Semiconductor Devices and Circuits," J. Evans and T. H. Walker. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow. 6 p.m.

I.E.E. (Maidstone). "Subscriber Trunk Dialling," H. E. Francis. Maidstone Technical College. 7 p.m.

I.E.E. (Mersey and N. Wales). Annual dinner. Adelphi Hotel, Liverpool. 7 p.m.

N.E. ELECTRICAL CLUB. "Flameproof at Home and Abroad," M. J. Deering. County Hotel, Neville St, Newcastle upon Tyne. 6.30 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (N. Eastern). "Economic Distribution of Steam," J. A. Robbins. Newcastle. 6 p.m.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Comparatron. 802,001. Class 9. Electronic test equipment for measuring or comparing two electrical quantities, etc. Mec-Test Ltd., The Lye, St. John's, Woking, Surrey.

Double Eddy. In design. 788,968. Class 11. Installations of the centrifugally operated type for the recovery of industrial dusts, etc. Ambuco Ltd., 2-5 Bond St, W.1.

Erma. 797,580. Class 7. Machines for crimping, etc. Erma Ltd., Mount Pleasant, Alperton, Wembley, Middx.

Hummel. B796,777. Class 9. Electric arc and resistance welding apparatus, etc. Elektro-Bau A.G., Krauss Strasse 7, Linz, Donau, Austria.

Metropole. 801,431. Class 7. Washing machines. Laden S.A., 3 rue Monceau, Paris 8e, France.

Milli mike in design. 795,411/2. Class 9. Apparatus, etc. Edgerton, Germeshausen and Grier Inc., 160 Brookline Ave, Boston, Massachusetts, U.S.A.

Orthonull. 799,566. Class 9. Resistance bridges. General Radio Co., West Concord, Massachusetts, U.S.A.

Silver Queen. 804,305. Class 11. Heating and lighting apparatus, etc. Aladdin Industries Ltd., Aladdin Bldg, Western Ave, Greenford, Middx.

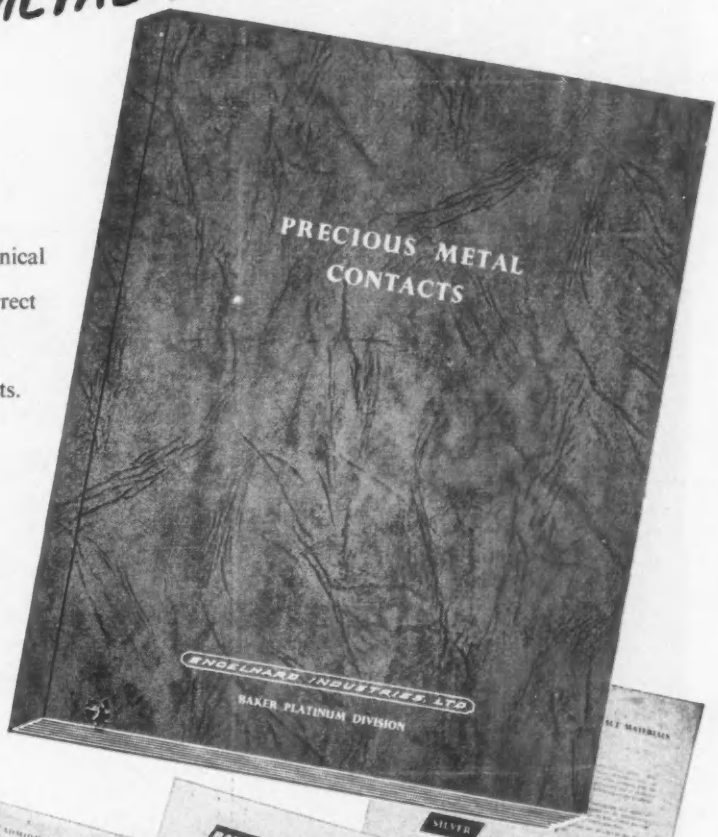
Superton. B802,359. Class 10. Electromedical acoustic apparatus, etc. Higheate Optical Mnfrs. Ltd., 44 Hatton Gdn, E.C.1.

Technelec. 806,893. Class 17. Electrical insulation varnishes, etc. Technical Dielectrics Ltd., Newhive Wks, Pennington St, Walshaw, Bury, Lancs.

Vacmobile. 804,862. Class 9. Suction cleaning apparatus for industrial use. Vacmobile Mnfg. Co. Ltd., Albion Wks, Old Oak, Common La, N.W.10.

Whirlpool. 801,723. Class 9. Vacuum cleaners, floor polishing machines, etc. Whirlpool Corpn., 300 Broad St, St. Joseph, Michigan, U.S.A.

Write for your copy of this NEW PRECIOUS METAL CONTACTS CATALOGUE



This new Catalogue presents in a clear and compact form full technical information to assist in the selection of the correct contact material and will prove an invaluable reference to all users of precious metal contacts. The catalogue has four sections under the following headings:

THE SELECTION OF CONTACT MATERIALS
- Electrical and Mechanical considerations
- Chemical and Metallurgical considerations

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REFERENCE TABLES

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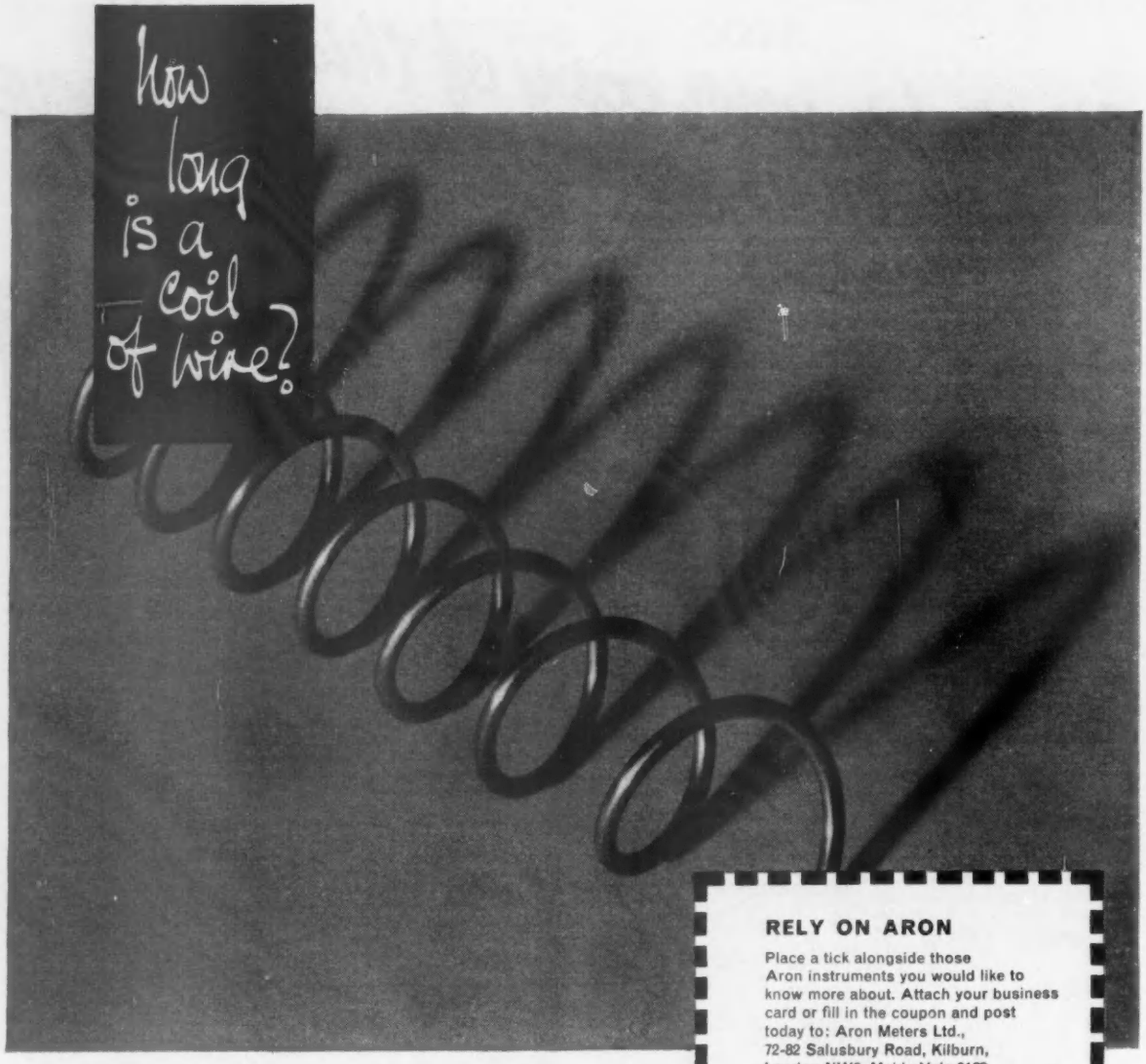
BAKER PLATINUM DIVISION
52 HIGH HOLBORN · LONDON · W.C.1 · *Telephone:* CHAncery 8711 & 6506



How far has it stretched since 1883? How can it measure the achievement of an industry? In 1883 Professor Aron invented the electricity meter. Since then, many thousand miles of wire have carried current through Aron measuring devices, and electronics has joined electromagnetics in the Aron industrial programme. Our summation equipment, wear-free because it is electronic, fault-free because it is Aron, is used in factories, hotels, office blocks to measure and record electrical energy used. As with every Aron instrument, it is taking Aron experience, service and economy to countless users throughout the world. Today's demand for Aron meters is greater than at any time in our successful pioneering history. It is an achievement of which we are justly proud.

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Timing Equipment
Testing Equipment

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CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

BOROUGH OF WREXHAM

GROUP "A" STREET LIGHTING
TRUNK ROAD A483 (PART)
Fixed-Price Tenders

INVITED for the supply, delivery and erection of 10 No. fluted steel columns and brackets having a mounting height of 25 ft, and Sodium Vapour 140 watt lanterns and lamps.

Conditions of contract may be inspected at the office of the Borough Engineer and Surveyor, 31 Chester St, Wrexham, from whom copies of the specification, Bill of Quantities and form of Order may be obtained.

Tenders to be delivered in a plain envelope endorsed "Street Lighting, Trunk Road" to be deliverd to the undersigned not later than 12 noon on Friday, 11 Nov., 1960.

PHILIP J. WALTERS,
Town Clerk.

Guildhall,
Wrexham.
Oct., 1960. (S 379)

SUFFOLK AND IPSWICH FIRE AUTHORITY

Proposed Fire Station, Colchester Road, Ipswich

ELECTRICAL CONTRACTORS wishing to tender for the complete electrical installation at the above should apply to Messrs. Johns, Slater and Haward, F./A.R.I.B.A., Architects, 32 Foundation St, Ipswich, not later than 10 Nov., 1960, for Specification, Plans and Form of Tender. Applications should be accompanied by a £2 2s 0d deposit, returnable upon receipt of a bona fide tender. Tenders in plain sealed envelopes bearing the words "Tender for electrical work at Colchester Road Fire Station, Ipswich," but with no name or mark to indicate the sender, must be sent to G. C. Lightfoot, Clerk of the Authority, County Hall, Ipswich, not later than 8 Dec., 1960. The Authority do not bind themselves to accept the lowest or any tender. (S 389)

COUNTY BOROUGH OF DERBY

Street Lighting on A.5111 (Raynesway) Trunk Road

TENDERS are invited for the supply of 49/200 watt sodium discharge lighting units mounted on 35 ft steel columns.

Tender documents may be obtained from the Borough Engineer and Surveyor, Council Hse, Corporation St, Derby.

Tenders, with completed Bill of Quantities, to be returned in a plain sealed envelope, endorsed "A5111 Street Lighting," to the undersigned not later than 9 a.m. on Thursday, 10 Nov., 1960.

N. S. FISHER,
Town Clerk.

Council Hse,
Corporation St,
Derby. (S 384)

CITY OF MANCHESTER HOUSING COMMITTEE

TENDERS invited (returnable noon, 7 Nov., 1960) for electrical installations to the following:

Contract 323: Greenwood Rd—12 flats, 2 shops and 10 garages.

Documents available from Director of Housing, Town Hall, Manchester 2. (S 376)

BOROUGH OF WATFORD

20 Elderly Persons' Flats

TENDERS are invited for the complete electrical installation, including embedded floor heating, of the above three-storey block. The successful tenderer will be nominated as a sub-contractor to the general contractor.

Applications for documents should be sent to the Borough Engineer, Town Hall, Watford, by 1 Nov., accompanied by a returnable deposit of £2 2s. and tenders are to be submitted by 2 p.m. on Wednesday, 7 Dec., 1960.

GORDON H. HALL,
Town Clerk.

Town Hall,
Watford. (S 403)

APPOINTMENTS VACANT

AUCKLAND ELECTRIC-POWER BOARD

Auckland, New Zealand

ELECTRICAL ENGINEER (PLANNING)

APPLICATIONS, from holders of an approved University Degree in Electrical Engineering or Corporate Members of the Institution of Electrical Engineers, will be considered for the position of Planning Engineer to the Auckland Electric-power Board, Auckland, New Zealand.

Applicants should not be over 45 years of age.

Duties will include planning of the distribution system to meet normal load increases, special supplies to large industries and investigations into special distribution problems.

Salary will be between £(N.Z.)1,505 and £(N.Z.)1,655 p.a., depending upon qualifications and experience.

Conditions of appointment may be obtained from:

Messrs. Preece, Cardew and Rider,
8-12 Queen Anne's Gate,
Westminster,
London S.W.1.

Applications, in duplicate and endorsed "Planning Engineer, Auckland Electric-power Board," must reach the office of Messrs Preece, Cardew and Rider not later than noon on Friday, 20 Jan., 1961. (S 414)

LONDON ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER

APPLICATIONS are invited for the above position. Initially, the successful candidate will be located at Battersea, S.W.11.

Applicants should have a sound technical education to the standard of the Higher National Certificate and have completed a recognised period of training in the Electricity Industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the post within the National Joint Board Agreement, the provisional minimum salary will be £685 per annum rising to £855 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref.: PER/V/3128/T. (S 409)

THE EAST MIDLANDS ELECTRICITY BOARD

Derby and Burton Sub-Area

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER (SALES AND DEVELOPMENT)
DERBY DISTRICT
Vacancy No. 116/60.

SALARY: N.J.B. Class H, Grade 9, £1,040/£1,165 per annum.

The successful applicant will be required to further the sales of electricity, including liaison with Architects, Builders and large consumers concerning all types of Industrial and Commercal installations, particularly Restricted Hour Load.

He will be required to organise promotional Sales Campaigns, give lectures and talks to various organisations, give advice on tariffs, obtain information to enable the Contracting Section to prepare specifications and quotations, and generally assist in the District Commercial Department.

Candidates should have had a sound technical training and the possession of the Higher National Certificate in Electrical Engineering or an equivalent qualification would be an advantage. Applicants should hold a current driving licence.

FOURTH ASSISTANT DISTRICT COMMERCIAL ENGINEER (CONTRACTING)
DERBY DISTRICT
Vacancy No. 117/60.

Salary: N.J.B., Class H, Grade 11, £890/£1,015 per annum.

The successful applicant will be required to assist with the preparation of specifications and quotations for all types of electrical contracting and maintenance work and carry out other duties as required in the District Commercial Department.

Candidates should have had a sound technical training and the possession of the Ordinary National Certificate in Electrical Engineering or the City and Guilds Certificate in Electrical Installation Work would be an advantage.

Applications for the above vacancies giving details of age, present position and salary, qualifications and experience, should be addressed to The Manager, Derby and Burton Sub-Area, Electricity Offices, Irongate, Derby, in a confidential envelope endorsed "Third Assistant District Commercial Engineer" or "Fourth Assistant District Commercial Engineer," respectively, within 14 days of the date of this advertisement.

Nottingham Sub-Area

DEMONSTRATOR
Vacancy No. 118/60.

Salary: N.J.C., Grade 1, £600 x £25/£700 per annum.

Applicants must be at least 21 years of age and should hold the E.A.W. Electrical Housecraft Certificate and have experience in conducting demonstrations in Service Centres and General Service Centre duties. Candidates should also be experienced in advising consumers on the selection and use of electrical appliances both at the Service Centre and on consumers' premises.

Applications giving details of age, present position and salary, qualifications and experience, should be addressed to The Manager, Nottingham Sub-Area, 35-39 Carrington St, Nottingham, within 14 days of the date of this advertisement.

Northamptonshire Sub-Area

FOURTH ASSISTANT ENGINEER
Re-advertised Vacancy No. 113/60.

Salary: N.J.B., Class K, Grade 12, £965/£1,090 per annum.

Duties include assisting in H.V. System commissioning tests, protective equipment tests and fault locating.

Ability to drive a car is essential and the successful candidate will be required to reside in or near Northampton.

Applications giving details of age, present position and salary, qualifications and experience, should be addressed to The Manager, Northamptonshire Sub-Area, 25 Bridge St, Northampton, within 14 days of the date of this advertisement. (S 426)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

ASSISTANT ENGINEER

APPLICATIONS are invited for the post of Assistant Engineer in the Department of the Distribution Engineer in the Head Office at Port of Spain.

Applicants must be graduate members of the Institution of Electrical Engineers or hold a degree or Higher National Certificate in Electrical Engineering. Candidates must have had special training or experience in the installation, commissioning and maintenance of modern protective equipment, and experience of metering and distribution systems and generating stations will be an advantage.

The commencing annual salary is £1,470 rising by annual increments of £40 to £1,590.

Housing

A partly furnished house will be provided at a rental of £10 8s 4d a month plus a small extra charge for heavy furniture.

Leave

45 days' annual leave is granted each year. 14 days of this must be taken locally and the balance can be accumulated for overseas leave after three years.

Passages

First class passages will be provided for the successful applicant and his wife and also for children up to the age of 18 up to a maximum cost of two adult passages for their children. Leave passages are provided after three years' service.

Outfit Allowance

A £60 outfit allowance will be paid on arrival in Trinidad.

Car Allowance

A car allowance for necessary mileage is paid and an interest-free loan advanced for the purchase of a car.

Information on Trinidad can be obtained from the West India Committee, 40 Norfolk St, London W.C.2.

Applications giving full details of qualifications, age and experience, together with two recent testimonials, should reach the General Manager, Trinidad and Tobago Electricity Commission, P.O. Box 121, Port of Spain, Trinidad W.I., on or before 7 Dec., 1960 (S 395)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

LITTLEBROOK GENERATING STATION

Vacancy No. 182A/60T.

DEVELOPMENT ENGINEER

THE successful candidate will be responsible to the Deputy Power Station Superintendent for the planning of future activities in both Operational and Maintenance fields and for practical co-ordination of large projects. An infectious enthusiasm for this type of work is essential.

Basic requirements are a sound technical background and experience of planning and co-ordination in a modern Power Station.

Salary: N.J.B. Class L, Grade 8, £1,400/£1,550 per annum, including London Allowance.

Applications giving age, details of experience, qualifications, etc., and quoting vacancy number, should be sent to the Station Superintendent, Littlebrook Power Station, nr. Dartford, Kent, to arrive by 7 Nov., 1960. (S 399)

EAST ANGLIAN REGIONAL HOSPITAL BOARD

Contracts for Engineering Services

THE Board invite applications for inclusion in their approved list of contractors for hospital engineering services in the East Anglian Region (Cambridgeshire, Isle of Ely, Norfolk, Huntingdonshire, East and West Suffolk, Soke of Peterborough and parts of South Lincolnshire and North Essex). Applications for further details from the Boards' Engineer, Block "B," Government Bldgs, Brooklands Ave, Cambridge, by 5 Nov., 1960. Firms already on the list need not re-apply unless they wish to amend the class of work, cost range and/or area of operation for which they are already included. (S 377)

AIR MINISTRY

require

ASSISTANT MECHANICAL AND ELECTRICAL ENGINEERS

FOR design construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for the R.A.F. at home and overseas as well as certain Civil Airports. Salary: £605 at 25 to £1,095 at 34 or over, thereafter rising to max. £1,260 with increase for London and slight decrease for country districts. Appointments long term with promotion and pension prospects. Five-day week with four weeks' two days' leave a year initially. Special allowances payable in addition to salary during overseas service.

Minimum qualifications and experience:

(i) (a) University degree or equiv. diploma in electrical and/or mechanical engineering with at least two years' apprenticeship; or

(b) Graduate or corporate member of I.E.E. with at least three years' apprenticeship; or

(c) Graduate or corporate member of I.Mech.E. appreciable electrical engineering experience with at least three years' apprenticeship; and

(ii) Have been employed for minimum of two years with well established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects betwen ages of 25 and 45. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King St, London S.W.1, quoting D.158/0A. (S 374)

ASSISTANT ENGINEER (ELECTRICAL)

REQUIRED for the London Office of the CROWN AGENTS FOR OVERSEA GOVERNMENTS AND ADMINISTRATIONS for appointment to pensionable establishment on probation for two years. Commencing salary between £830 at age 25 and £1,125 at age 34 or over in scale rising to £1,300. Fully qualified officer at least 27 years of age may be eligible for special increase of £75 within maximum of scale after two years' service. Liberal leave. Five-day week.

Candidates, preferably between 25 and 35 years of age should have degree in Electrical Engineering or be Corporate Member of the Institute of Electrical Engineers. They should have received their training with established electrical manufacturer, contractor or undertaking and have had subsequent operating or design experience in either medium size thermal power stations, transmission and distribution systems, or consumer's installations. Previous contract experience an advantage.

Duties include purchase of electrical plant and equipment, preparation of specifications for tenders, adjudication of tenders and technical correspondence with Administrations.

Apply to CROWN AGENTS, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/51092/EE. (S 386)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Stirling Area

DISTRICT COMMERCIAL ENGINEER

STIRLING DISTRICT

(Vacancy Ref. 71/60)

APPLICANTS should preferably be corporate members of the Institution of Electrical Engineers or possess equivalent qualifications, be experienced in the supply of electrical energy to and its utilisation by industrial, commercial, domestic and agricultural consumers and be conversant with installation work.

N.J.B. Conditions. Salary: Class F, Grade 2, £1,440/£1,610 per annum. The post is superannuable.

The successful applicant will require to reside within a reasonable distance of the District Office in Stirling.

Applications, on the standard form obtainable from Area Manager, S.S.E.B., "Woodlands," St. Ninians Rd, Stirling, should be submitted not later than 9 Nov., 1960. (S 372)

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

THIRD ASSISTANT ENGINEER
ELECTRICAL DEPARTMENT
DIVISIONAL HEADQUARTERS
GENERATION HOUSE
Vacancy No. 60/867.

Applicants should preferably be Corporate or Graduate Members of the Institution of Electrical Engineers or possess other qualifications. They should have experience in the design, layout and installation of High Voltage Substation plant, including the preparation of schemes, specifications and estimates, and be able to deal with Contract correspondence. A knowledge of site testing and commissioning is desirable. Salary: Class EX Grade 8=from 1.7.60 £1,155/£1,460, from 1.7.61 £1,195/£1,460 per annum.

Applicants for Vacancies Nos. 60/72 and 60/400 will be considered and need not re-apply.

ASSISTANT ENGINEER (INSTRUMENTS)
BELVEDERE POWER STATION
Vacancy No. 60/868.

To assist the Assistant Maintenance Engineer (Instruments) as required in a station with automatic Boiler and centralised unit control. Salary: Class L, Grade 10=£1,240 per annum.

STATION SHIFT CONTROL ENGINEER
STEPNEY POWER STATION
Vacancy No. 60/869.

Good technical qualifications to H.N.C. standard or equivalent with sound technical training and practical experience in the control and operation of steam generating plant and high voltage switchgear. Salary: Class F, Grade 10=£875/£900, plus £90/£94 shift per annum.

Applications are invited for following superannuable post. Salary includes London Allowance.

CHEMICAL ASSISTANT
HACKNEY POWER STATION
Vacancy No. 60/870.

Candidates should have as minimum G.C.E. in English, Maths, Physics and Chemistry. Day release up to 21 years for further study. Duties include work in laboratory and on power station plant. Salary rising to £855 per annum.

Applications, quoting vacancy No. to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 135, London W.1. by 8 Nov., 1960. (S 383)

SIERRA LEONE GOVERNMENT

Electricity Department

STATION SUPERINTENDENTS

REQUIRED on contract for two tours of 18-24 months each in first instance. Gross salary according to age and experience in scale rising to £1,528 a year. Gratuity at rate 15% of total salary drawn. Outfit allowance £60. Children's allowances £48/£288 a year. Free passages. Liberal leave on full salary.

Candidates, between 21-40 years of age, must have served full apprenticeship with Electrical Engineering company and have had several years' experience of operation and maintenance of power stations in a responsible position. They should preferably hold M.O.T. Cert. (Steam and Diesel) or equivalent. Good knowledge of power station electrical equipment desirable.

Newly qualified Mechanical Engineers with some practical experience in steam turbines will be considered.

Apply to CROWN AGENTS, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/50789/EE. (S 387)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

THE NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER
EXPERIMENTAL LABORATORY, SALFORD

THE successful candidate will be required to assist in the type-testing of all kinds of equipment for distribution systems up to 33 kV and in interesting technical investigations. Applicants should hold the H.N.C. or an equivalent qualification in Electrical Engineering and experience on underground and overhead electricity supply systems would be an advantage.

Salary scale: £1,105/£1,410 p.a. Class BX, Grade 8. N.J.B. Conditions.

Applications on forms to be obtained from the Secretary, The North Western Electricity Board, Cheetwood Rd, Manchester 8, and returned to him by 8 Nov., 1960.

THIRD ASSISTANT DISTRICT ENGINEER
BLACKBURN DISTRICT

The duties include assisting in the operation, maintenance and construction of underground and overhead mains, substations and transformers, and to undertake standby duties. Preference given to applicants who are graduate members of the Institution of Electrical Engineers or who possess the H.N.C. in Electrical Engineering.

Salary scale: £1,115/£1,245 p.a. Grade J.9. N.J.B. Conditions.

Applications on forms to be obtained from the Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee St, Blackburn, and returned to him by 8 Nov., 1960. (S 385)

MIDLANDS ELECTRICITY BOARD

THIRD ASSISTANT ENGINEERS (TWO)

REQUIRED for the Planning and Operations Section at the Headquarters of the Worcester and District Sub-Area.

Duties will include load and voltage calculation required in connection with planning schemes up to 66 kV. Examination and preparation of new development and reinforcement schemes. Examination of protective gear requirements, including calculations of fault level and relay settings. Technical qualifications desirable.

Salary: £1,115/£1,245 per annum. (N.J.B., Grade K10). Superannuable.

Apply, by letter, within 14 days, stating age, qualifications, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, P.O. Box No. 52, Blackpole Rd Worcester.

F. W. CATER,
Secretary.
(S 390)

ELECTRICAL ENGINEERING ASSISTANTS

REQUIRED with technical experience for:

(i) Design of electrical installations for large buildings, such as schools, flats or industrial: or

(ii) Maintenance and improvement of electrical installations in buildings of the above type.

Up to £1,250 depending on qualifications and experience. Staff restaurant. Pension scheme. Forms from Chief Engineer (GS/ET/2729/10), L.C.C., County Hall, S.E.1. (S 375)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

FOURTH ASSISTANT ENGINEER

REQUIRED in the System Operation Department at Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 11, Class CX, Scale 9, Salary range £855/£1,245 per annum.

The duties are of a technical and statistical nature and will include the evaluation of various costs affected by System Operation, also Control Room duties during office hours. Applicants should have had sound engineering training with preferably some experience in the Electricity Supply Industry. Good technical education required and the minimum qualification of O.N.C.

Apply, quoting Vacancy No. 285/60MD on Form AE6 available from the System Operation Engineer, Warwick Hse, Redhill Rd, Kings Norton, Birmingham 30, by 7 Nov., 1960. (S 381)

BOROUGH OF BARKING

Borough Engineer and Surveyor's Department

APPLICATIONS are invited for the following permanent appointment:

THIRD ENGINEERING ASSISTANT
(ELECTRICAL AND MECHANICAL)
WITHIN GRADE A.P.T. I, £645/£815, PLUS APPROPRIATE LONDON WEIGHTING

Candidates must have gained experience in the installation and maintenance of heating and electrical systems after serving as an apprentice with a reputable firm. They should hold, in whole or in part, the appropriate National Certificate or equivalent qualification.

Local conditions include pleasant modern offices in a new Town Hall and a substantial number of Saturday mornings free of duty.

Further particulars and application forms may be obtained from the Borough Engineer and Surveyor, Town Hall, Barking, and must be returned to the undersigned not later than 9 a.m., on Monday, 7 Nov., 1960.

E. R. FARR,
Town Clerk.

Town Hall,
Barking. (S 369)

LONDON ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEERS

APPLICATIONS are invited for the above positions. Initially, the successful candidates will be located at Lithos Rd, Hampstead, N.W.3.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the Electricity Industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the posts within the National Joint Board Agreement, the provisional minimum salary will be £685 per annum rising to £855 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, London E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref.: PER/V/3126/T. (S 380)

CITY OF BIRMINGHAM
PUBLIC WORKS DEPARTMENT

Mechanical & Public Lighting Section

VACANCY FOR ELECTRICAL ENGINEER
SPECIAL GRADE, £840/£1,145 PER ANNUM

APPLICANTS should be Associate Members of the Institution of Electrical Engineers or hold the Higher National Certificate, or the Diploma of the Illuminating Engineering Society (with 5 years' experience).

Candidates should have experience of lighting engineering with particular reference to public lighting.

The post is permanent, superannuable and subject to a medical examination.

Applications stating qualifications, age and experience, and naming two referees, should reach the undersigned by 11 Nov., 1960.

Canvassing disqualifies.

HERBERT J. MANZONI,
City Engineer and Surveyor.

Civic Centre,
Birmingham 1. (S 393)

CORPORATION OF GLASGOW

Architectural and Planning Department

ASSISTANT ENGINEER (ELECTRICAL)

APPLICATIONS for the above, superannuable, appointment are invited from Graduates and Associate Members of the Institution of Electrical Engineers. Salary scale: £794 £1,385 with placing according to qualifications and experience. There is a point within the scale at which increments may be accelerated.

Form of application may be obtained from the Principal Administrative Officer, 20 Trongate, Glasgow C.1.

A. G. JURY,
City Architect and Director of Planning.
(S 339)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Appointment of Accountants

Applications are invited from qualified Accountants for the following appointments, at the salaries stated.

Candidates should have a thorough knowledge of accounting practice in the Electricity Supply Industry and be fully experienced in modern accountancy methods including punched card installations and electronic calculators, and in controlling a large staff.

Apply by letter giving details of age, qualifications, experience and present position to the Managers at the addresses given below, by 12 Nov., 1960.

(1) ACCOUNTANT
NORFOLK SUB-AREA
277/60.R.

Salary: £2,170/£2,380 per annum (N.J.M., Grade 5, Class C).

4 Duke St, Norwich.

(2) FIRST ASSISTANT TO THE ACCOUNTANT
NORTHMET SUB-AREA
278/60.R.

Salary: £2,025/£2,230 per annum, including London Allowance (N.J.M., Grade 1, Class F).

Northmet Hse, Southgate, N.14.

Chilterns Sub-Area

AYLESBURY DISTRICT
(i) TWO THIRD ASSISTANT ENGINEERS
279/60.N.
(ii) FOURTH ASSISTANT ENGINEER
280/60.N.

Candidates for these positions should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems, including substations.

Salary: N.J.B., Class F: (i) Grade 9 (£890/£1,015); (ii) Grade 11 (765 £870).

Apply by letter to the Manager, Aylesbury District, Eastern Electricity Board, Exchange St, Aylesbury, Bucks., by 11 Nov., 1960.

Essex Sub-Area

THURROCK DISTRICT
TRAINEE DEMONSTRATOR
281/60.R.

Candidates should have had domestic science training. A sound knowledge of electrical appliances and experience in the Electricity Industry would be an advantage. Duties will include assistance to Demonstrators.

Salary: N.J.C. Scale, £265/£565 plus London Allowance.

Apply by letter to H. J. Unwin, A.M.I.E.E., Manager, Thurrock District, Maidstone Rd, Grays, Essex, by 11 Nov., 1960. (S 405)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 283/ET/60.

APPLICATIONS invited for the superannuable N.J.B. appointment of FOURTH ASSISTANT ENGINEER in the Efficiency, Testing and Combustion Section of the Generating Department at Divisional Headquarters, Cardiff.

Salary: Schedule B, Class AX, Grade 11, Scale 7 (£855/£1,090 per annum).

The work of the section is concerned with both acceptance and routine tests and the investigation into the safe and efficient operation of all power station plant within the Division. The experience gained in this Section will be exceedingly useful when applying for higher positions within the Generating Board.

Candidates should possess at least a Higher National Certificate in mechanical or electrical enginering. Previous experience of power plant operation and testing and knowledge of instruments is desirable but not essential.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 11 Nov., 1960. (S 408)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

ASSISTANT MAINTENANCE ENGINEER (MECHANICAL)
NORTHAMPTON POWER STATION
Vacancy No. 242/60.

APPLICATIONS are invited for the position of Assistant Maintenance Engineer (Mechanical) at Northampton Power Station, Nunn Mills Rd, Northampton.

Applicants should have received a thorough technical and practical training, preferably holding the Higher National Certificate in Mechanical Engineering, and have had wide experience in power station mechanical maintenance.

Salary will be in accordance with Class G, Grade 7 (£1,115/£1,245 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 5 Nov., 1960.

SECOND ASSISTANT STATION CHEMIST
WILLINGTON "A" AND "B" POWER STATIONS
Vacancy No. 243/60.

Applications are invited for the position of Second Assistant Station Chemist at Willington "A" and "B" Power Stations, P.O. Box 27, Derby.

It is desirable that applicants have a University Degree or Associateship of the Royal Institute of Chemistry and experience in general chemical analysis, with particular experience in the physico-chemical apparatus such as Spectrophotometer, and a knowledge of statistical methods.

Salary will be in accordance with Class M, Grade 11 (£1,190/£1,325 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 12 Nov., 1960.

SHIFT CHARGE ENGINEER
DERBY POWER STATION
Vacancy No. 244/60.

Applications are invited for the position of Shift Charge Engineer at Derby Power Station, Full St, Derby.

Applicants should have a sound technical training and considerable experience in a modern power station. Preference will be given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers, or who hold similar qualifications. A knowledge of pulverised fuel firing will be an advantage.

Salary will be in accordance with Class F, Grade 7 (£1,040/£1,165 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 12 Nov., 1960.

SHIFT CHARGE ENGINEER
WILLINGTON "A" POWER STATION
Vacancy No. 245/60.

Applications are invited for the position of Shift Charge Engineer at Willington "A" Power Station, P.O. Box 27, Derby.

Candidates should have had a sound technical training and considerable experience in a modern power station. Preference will be given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers, or who hold similar qualifications. A knowledge of pulverised fuel firing will be an advantage.

Salary will be in accordance with Class L, Grade 6 (£1,535/£1,720 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 12 Nov., 1960.

ASSISTANT SHIFT CHARGE ENGINEER
CASTLE DONINGTON POWER STATION
Vacancy No. 240/60.

Applications are invited for the position of Assistant Shift Charge Engineer at Castle Donington Power Station, nr. Derby.

Candidates should have received a thorough practical and technical training and have had experience in the operation of modern high merit plant, together with the control of staff.

Technical qualifications leading to Corporate Membership of a professional institution will be an added advantage.

Salary will be within Class L, Grade 8 (£1,350/£1,500 per annum) of the National

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Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 5 Nov., 1960.

ASSISTANT SHIFT CHARGE ENGINEER
COVENTRY POWER STATION
Vacancy No. 247/60.

Applications are invited for the position of Assistant Shift Charge Engineer at Coventry Power Station, Alderman's Green, Coventry.

Applicants are required to take charge of shift operation of boiler house plant, and must possess a sound technical training, a good general engineering experience, and knowledge of the control and operation of water tube boilers, ancillary plant and the efficient combustion of chain grate stokers.

Salary will be in accordance with Class G, Grade 9 (£965/£1,090 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 12 Nov., 1960.

GENERAL ASSISTANT ENGINEERS
SPONDON POWER STATION
Vacancy No. 248/60.

Applications are invited for the positions of General Assistant Engineers at Spondon Power Station, nr. Derby.

Candidates should be suitably qualified men who are interested in power station operation and/or maintenance as a career.

Facilities are available whereby experience can be obtained in all sections of a large modern power station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend on qualifications and knowledge, and will be within the range £625/£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 12 Nov., 1960.

GENERAL ASSISTANT ENGINEERS (CHEMISTS)
SPONDON POWER STATION
Vacancy No. 249/60.

Applications are invited for the positions of General Assistant Engineers (Chemists) at Spondon Power Station, nr. Derby.

Candidates must have had a sound technical training and previous laboratory experience and should preferably hold the Higher National Certificate in Chemistry, but consideration will be given to candidates studying for that qualification.

The salary will be within the range £625/£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 12 Nov., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

O. S. WOODS,
Divisional Controller.
(S 418)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

ASSISTANT ENGINEER (SHIFT)
NORTHFLEET GENERATING STATION
Vacancy No. 214/60T.

REQUIRED for general operation duties on shift. Relevant experience within a modern generating station is necessary.

Salary: N.J.B., Class M, Grade 10, £1,452 10s/£1,601 per annum including London and shift allowances.

Applications, giving age, details of experience, qualifications, etc., and quoting vacancy number, should be sent to the Station Superintendent, Northfleet Generating Station, Crete Hall Rd, Northfleet, Kent, to arrive by 10 Nov., 1960.

W. H. DUNKLEY,
Divisional Controller.
(S 404)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER (STANDARDISATION)

BOURNEMOUTH District of No. 4 (Bournemouth) Sub-Area. Salary: N.J.B., Class J, Grade 9 (£1,115/£1,245 per annum). N.J.B. Conditions of Service.

The duties of the post will be to work under the Grade 6 Assistant Engineer (Standardisation), who will be responsible to the District Engineer for the organisation and supervision of the work of modifying and/or replacing consumers' apparatus on the voltage standardisation programme for the Bournemouth District. (There are at present more than 60,000 consumers in Bournemouth District who are supplied at a pressure of 200 volts.) Experience in change-over work connected with voltage standardisation and the possession of a suitable technical qualification will be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, and returned to him, quoting Z.1249, not later than 7 Nov., 1960.

SENIOR ASSISTANT

Purchasing Department of Head Office. Salary: N.J.C., Grade 6 (£1,150/£1,240 per annum). N.J.C. Conditions of Service.

The duties of the post will include assisting the Principal Assistant with the issuing of enquiries and receipt of tenders for Transformers, Switchgear, Meters and allied equipment. A current knowledge of manufacturers and suppliers of these items is required, together with a knowledge of bulk buying in a large scale organisation. A background of technical engineering experience would be an advantage.

Applications on forms obtainable from the Secretary, Southern Electricity Hse, Littlewick Green, Maidenhead, Berks, and returned to him, quoting Z.1269, not later than 7 Nov., 1960.

ASSISTANT ENGINEER (MAINTENANCE AND OPERATION)

Swindon District of No. 2 (Newbury) Sub-Area. Salary: N.J.B., Class G, Grade 9 (£965/£1,090 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1253, not later than 7 Nov., 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. (S 402)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Aberystwyth District of the Board's No. 4 Sub-Area, based on Aberystwyth:

(a) RECORDS DRAUGHTSMAN

(b) SALES REPRESENTATIVE

Salary within the range £600/£700 per annum (N.J.C., Grade 1).

Applicants for post (a) should have had general experience in a Drawing Office in the preparation of plans and schedules, and be able to prepare, from information obtained direct on site, map records of overhead lines and underground cables and records of substation layout.

Applicants for post (b) should be of good appearance and possess a wide knowledge of electrical appliances, their correct usage and running costs. Duties will include outside sales, calling on consumers to promote sales of electrical appliances, following up consumers' inquiries and relief duties in Service Centres as required.

Appointments subject to medical examination. Pension Scheme.

Standard application forms obtainable from the Manager, No. 4 Sub-Area, Rhostyllen, Nr. Wrexham, or from any District Office.

Closing date: 7 Nov., 1960. (S 411)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN
GENERAL ASSISTANT ENGINEER

REQUIRED at No. 3 Sub-Area Headquarters, Chester. Salary within range £765/£870 per annum (N.J.B., K.15).

Applicants should have experience on the general design and layout of indoor and outdoor substations up to 33 kV, cable layouts and diagrams of connection, and have obtained suitable technical qualifications.

Appointment subject to medical examination. Pension Scheme.

Applications, on forms obtainable from the Manager, No. 3 Sub-Area, Electricity Hse, Newgate St, Chester, must be forwarded not later than 7 Nov., 1960. (S 412)

THE SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER

APPLICATIONS are invited for the position of Assistant Engineer in the Port Talbot District of the Swansea and West Central Area of the Board.

The successful applicant will be required to undertake engineering duties which initially will be of a general nature. Extensive development is being carried out within the District, and the post would provide excellent opportunities to a qualified electrical engineer already possessing operational experience.

Salary: N.J.B. Class H, Grade 9, Scale 8 (£1,040/£1,165).

Applications stating age, present position, present salary, qualifications and experience should be addressed to G. R. T. Edwards, B.SC., M.I.E.E., M.AM.I.E.E., Manager, Swansea and West Central Area, 29 Ystrad Rd, Swansea Industrial Estate, Swansea, Glam, to arrive not later than Saturday, 12 Nov., 1960. Please quote reference 195/60/ET, endorsing envelope "Assistant Engineer."

SURVEYOR/DRAUGHTSMAN

Applications are invited for the position of Surveyor/Draughtsman in the Rhondda District (Porth) in the Cardiff and East Central Area of the Board.

In addition to a knowledge of surveying, experience of technical and cartographical draughtsmanship is essential.

The provisional salary for this position will be within Scale 3, i.e. (£715/£805 per annum).

Applications stating age, present position, present salary, qualifications and experience should be addressed to C. L. Townsend, ASSOCIATE I.E.E., Manager, Cardiff and East Central Area, 445-447 Cowbridge Rd East, Cardiff, to arrive not later than Saturday, 12 Nov., 1960. Please quote reference 159/60/ET, endorsing envelope "Surveyor Draughtsman."

R. G. WILLIAMS,
Secretary.
(S 413)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

THIRD ASSISTANT COMMERCIAL ENGINEER

REQUIRED at No. 3 Sub-Area Headquarters, Chester.

Salary: £1,115/£1,245 per annum (N.J.B., K.10).

Applicants should preferably have had technical training and experience in electrical load development for industrial, commercial, rural and domestic premises.

Appointment subject to medical examination. Pension Scheme.

Application forms obtainable from the Manager, No. 3 Sub-Area, Electricity House, Newgate St, Chester. Closing date: 10 Nov., 1960. (S 401)

CENTRAL ELECTRICITY GENERATING BOARD
South Wales Division

APPLICATIONS invited for the superannuable N.J.B., Schedule A appointments of ASSISTANT SHIFT CHARGE ENGINEERS in the following Power Stations.

TIR JOHN POWER STATION, SWANSEA
Vacancy No. 277/ET/60.

Salary: Class H, Grade 9, Scale 8 (£1,040/£1,165 per annum).

LLYNFI POWER STATION
Nr. BRIDGEND, GLAM.
Vacancy No. 278/ET/60.

Salary: Class G, Grade 9, Scale 7 (£965/£1,090 per annum).

ROGERSTONE POWER STATION
Nr. NEWPORT, MON.
Vacancy No. 279/ET/60.

Salary: Class G, Grade 8, Scale 8 (£1,040/£1,165 per annum).

CARMARTHEN BAY POWER STATION
BURRY PORT, CARMS.
Vacancy No. 280/ET/60.

Salary: Class K, Grade 8, Scale 11 (£1,275/£1,410 per annum).

UPPER BOAT POWER STATION
Nr. PONTYPRIDD, GLAM.
Vacancy No. 281/ET/60.

Salary: Class H, Grade 9, Scale 8 (£1,040/£1,165 per annum).

USKMOUTH "B" POWER STATION
WEST NASH, Nr. NEWPORT, MON.
Vacancy No. 282/ET/60.

Salary: Class K, Grade 8, Scale 11 (£1,275/£1,410 per annum).

10% shift allowance payable in all cases.

Applicants for the above posts should possess H.N.C. or equivalent qualifications, and have had operating experience in a modern power station.

Special application forms are obtainable from the Divisional Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 11 Nov., 1960. (S 407)

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEERS

APPLICATIONS are invited for the above positions in the Board's Eastern District at 84 Romford Rd, Stratford, E.15.

Applicants should have had a sound technical education to the standard of the Higher National Certificate and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

The posts are graded under Schedule A of the National Joint Board Agreement as Class J, Grade 14, £805 per annum rising to £920 per annum, inclusive of London Area Allowance.

Application form obtainable from Manager, Eastern District, 84 Romford Rd, Stratford, E.15, to be returned completed within 14 days of the publication date of this notice. Please quote ref: PER/V/3110/T. (S 410)

CENTRAL ELECTRICITY GENERATING BOARD
Eastern Division

APPLICATIONS are invited for the following appointment:

ASSISTANT ENGINEER
(INSTRUMENTS)
SOUTH DENES (GREAT YARMOUTH) GENERATING STATION

Salary: N.J.B., Class J, Grade 8, Scale 10, £1,190/£1,325 per annum.

Applicants should have sound technical and practical experience in the construction, testing, repair and maintenance of modern generating station instruments.

A good knowledge of electronics, also electrical and pneumatic control systems will be an advantage.

Applications, quoting Staff Vacancy No. 1400, stating age, qualifications, experience and present position should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts., by 5 Nov., 1960. (S 394)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

CHIEF DRAUGHTSMAN

REQUIRED at No. 1 Sub-Area Headquarters in Liverpool.

Salary within range £1,535/£1,720 per annum (N.J.B. M/7).

Applicants should have had a good general and technical education, and experience in the control of a large Drawing Office associated with:

(a) The preparation of drawings in connection with substation and building construction, and the layout of h.v. and m.v. switchgear and associated equipment, cables, etc.
(b) The preparation and keeping of mains records for an extensive h.v. and m.v. overhead and underground distribution system.
(c) Print and Photo Room work.
(d) Obtaining and issuing statutory consents associated with building construction and extensions to the h.v. and m.v. distribution system.

Appointment subject to medical examination. Pension Scheme.

Forms of application may be obtained from the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3, and should be returned not later than 7 Nov., 1960. (S 415)

CENTRAL ELECTRICITY GENERATING BOARD
South Western Division

ASSISTANT ENGINEER
(ELECTRICAL MAINTENANCE)
Vacancy No. ET/AV/145/60.

REQUIRED at Hayle Power Station. Superannuation Scheme. Salary: N.J.B., Class F, Grade 9, Scale 6, £890/£1,015 per annum.

Preference will be given to candidates who hold the Higher National Certificate in Electrical Engineering and have had experience with maintenance of H.V. and L.V. Switchgear and Motors.

Previous applicants need not apply.

ASSISTANT ENGINEERS (OPERATION)
Vacancy No. ET/AV/146/60.

Required at Berkeley Nuclear Power Station.

Superannuation Scheme. Salary: N.J.B., Class M, Grade 12, Scale 9, £1,115/£1,245 per annum, plus 10% shift allowance when applicable.

Candidates should have experience in the operation of modern power plant and possess technical qualifications admitting to Corporate Membership of one of the senior Engineering Institutions.

After a period of theoretical and practical training successful applicants will be employed on shift work in the central control room taking responsibility for the control of a reactor and its associated generating plant. They will also spend regular periods on the plant, carrying out work under the supervision of the Shift Charge Engineer, thus enabling them to qualify for more senior appointments.

Applications on Form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 7 Nov., 1960. (S 419)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SENIOR ASSISTANT COMMERCIAL ENGINEER
(INDUSTRIAL DEVELOPMENT)

REQUIRED in the Chief Commercial Officer's Department at Board Headquarters, Love La, Liverpool 3.

Salary within range £1,650/£1,830 per annum (N.J.B. AX.3).

Applicants should possess suitable technical qualifications and have good experience, including the handling of negotiations for very large industrial electrical supplies at the highest level.

Appointment subject to medical examination. Pension Scheme.

Applications should be made on forms obtainable from the Establishments Officer at the above address.

Closing date: 10 Nov., 1960. (S 416)

BRISTOL COLLEGE OF SCIENCE AND TECHNOLOGY
(A College of Advanced Technology)
Ashley Down, Bristol, 7
PRINCIPAL: G. H. MOORE, M.SC., F.P.S., F.R.I.C.

THE Governors invite applications for post of:

LECTURER
or
ASSISTANT, GRADE B

To teach heavy current subjects in courses leading to Dip. Tech., I.E.E. Part III, Higher National Diploma and Higher National Certificate.

Candidates must hold appropriate academic and or professional qualifications, and should have had teaching, industrial and/or research experience.

Salary within range £1,370/£1,550 (Lecturer) or £700 £1,375 (Grade B), according to experience and qualifications.

Application forms, returnable within two weeks, and details from the Registrar. (S 382)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable position as a
THIRD ASSISTANT ENGINEER
(ELECTRICAL)
in the Distribution/Transmission (Construction) Section of the Chief Engineer's Department at Board Headquarters.

Candidates should have had a good general and technical education and, preferably, possess a minimum qualification of Higher National Certificate in Electrical Engineering. The duties associated with the post will include the supervision of contracts involved in the construction of 132 kV substations and correspondence in connection therewith. Experience in such work will be considered an advantage.

Salary: N.J.B., Class BX, Grade 8, £1,105/£1,410 per annum.

Applications, quoting reference E38/60, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 11 Nov., 1960. (S 367)

YORKSHIRE ELECTRICITY BOARD
No. 3 (Sheffield) Sub-Area
THIRD ASSISTANT ENGINEER
(PROTECTION AND TESTING)

APPLICANTS should have technical qualifications equivalent to Graduate Membership of the Institution of Electrical Engineers and have had experience in all branches of protective gear work including network calculations.

Experience in cable fault location is desirable.

Salary: N.J.B., Class N (Notional), Grade 10 (Scale 12), £1,350/£1,500 per annum.

Applications, together with the names of two referees, should be returned to the Manager, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 11 Nov., 1960. (S 421)

CENTRAL ELECTRICITY GENERATING BOARD
Southern Division
THIRD ASSISTANT ENGINEER
TRANSMISSION DEPARTMENT

APPLICANTS should have had training and experience of the operation and maintenance of H.V. and L.V. supply systems or have received a works training on high voltage switchgear, transformers or cables. Previous experience of the erection of either overhead lines, cables or substations will be an advantage.

Applicants should preferably possess qualifications leading to corporate membership of an appropriate professional institution.

Salary: N.J.B., Grade AX8, £1,105/£1,325.

Special application forms (not AE6/ACT) obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by Tuesday, 8 Nov., 1960. (S 406)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division
ASSISTANT SHIFT CHARGE ENGINEER

REQUIRED at Ocker Hill Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G.9, £965/£1,090 per annum plus 10% for shift duties.

A sound technical training and practical power station experience are required in the operation of steam generating plant and main switchgear. Appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 287/60MD on Form AE6, available from the Station Superintendent, Ocker Hill Power Station, Ocker Hill, Tipton, Staffs. Closing date for receipt of applications: 7 Nov., 1960. (S 420)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division
ASSISTANT CHEMIST
DIVISIONAL LABORATORY
Vacancy No. 246/60.

APPLICATIONS are invited for the position of Assistant Chemist in the Divisional Laboratory at North Wilford Power Station, Queen's Dr, Nottingham.

Candidates should be capable of initiating and leading investigations into one or more of the following topics: Air Pollution, River Pollution, Industrial Water Treatment, Analytical Method Development, and should have a sound knowledge of inorganic analysis.

Candidates should hold a degree or equivalent professional qualification. Previous power station experience is advantageous although not essential.

Salary will be in accordance with Class BX, Grade 8 (£1,105/£1,410 per annum) of the National Joint Board Agreement, and the position will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, P.O. Box 25, Barker Gate, Nottingham, and should be returned to him not later than 19 Nov., 1960.

O. S. WOODS,
Divisional Controller.
(S 417)

ASSISTANT ELECTRICAL ENGINEER required by National Newspaper. Age 23-28. Electrical apprenticeship and Higher National. Must be first class electrical draughtsman. Good prospects. Box No. 8041, Electrical Times. (S 316)

BRITISH Engine Boiler and Electrical Insurance Co. Ltd., Longridge Hse, Manchester 4. ELECTRICAL SURVEYOR required in Scotland, also Manchester. Permanent position carrying progressive salary scale £800 to £1,100 and non-contributory pension. Condidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (S 396)

ELECTRICAL ENGINEER

To take charge of the power frequency section of the largest and most up-to-date high voltage laboratory in the country, using experimental voltages up to 1,300 kV. If you have a good honours degree in electrical engineering and are interested in this type of work, you are invited to write, stating your age, qualifications, experience and present salary to:

The Personnel Officer
(Graduate Recruitment)
Pilkington Brothers Limited
St. Helens, Lancashire.
(S 370)

A LONDON CONSULTING ENGINEER

engaging staff for large and interesting new projects now requires supporting staff for his Senior Electrical Engineers. The grade most required is that of **JUNIOR ELECTRICAL ENGINEER / DRAUGHTSMAN** to work on electrical installation design within buildings, the salary for this grade being £650/£850 according to experience in this field.

Preference will be given to applicants with some practical training and holding Ordinary National Certificate.

The organisation, which is well known to Industry and Commerce, has welfare and social facilities, luncheon vouchers issue and a superannuation scheme.

Applicants should state age, experience, qualifications and salary required. Box No. 8059, Electrical Times.

(S 425)

CONSULTING Engineer requires for Dublin Office DESIGN ENGINEER for electrical services in large buildings. Applicants must have at least four years' experience. Reply in confidence to Varming and Mulcahy, 4 Northbrook Rd, Dublin, giving details of experience, age, qualifications and salary expected. (S 373)

ELECTRICAL ENGINEER required for Glasgow Office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler and Electrical Insurance Co. Ltd., 98 West George St, Glasgow C.2. (S 397)

J. & P.

TRANSFORMER DEVELOPMENT

A development unit and pilot plant is to be created in a locality to be selected.

An experienced transformer design engineer will be required to build up the unit and control the operation of the plant. This is an appointment of senior responsibility and applications are invited from men with the requisite qualifications.

Applications, which will be treated in strict confidence should, in the first instance, be addressed to The General Manager, Johnson & Phillips Limited, Charlton, London S.E.7.

(S 391)

FORD

have an opening for an

ELECTRICAL DESIGN DRAUGHTSMAN

Applicants must have had experience of electrical installation work and should possess a sound knowledge of Power and Lighting Design.

Minimum desirable qualification is O.N.C. but consideration will be given to non-qualified men with five years' practical design experience.

Please write giving details of age, experience, qualifications and salary required, and quoting reference KED, to:

MR H. C. CRAWFORD,
TRAINING AND RECRUITMENT DEPARTMENT,
FORD MOTOR COMPANY LIMITED,
DAGENHAM · ESSEX.

(S 371)

ELECTRICAL ENGINEER SURVEYOR required by Cornhill Insurance Company Limited in the South East London-Kent area. Applicants must have Winding Shock experience and a technical education to H.N.C. or Grad. I.E.E. Salary commencing £800 per annum rising to £1,100 per annum. Pension Scheme. Reply, stating age and experience, to Chief Engineer, P.O. Box 10, 57 Ladymead, Guildford, Surrey. (S 366)

EXPERIENCED Transformer Designer required. Write with full particulars of past experience, qualifications and salary required to Box No. 8057, Electrical Times. (S 424)

INSPECTION ENGINEER—ELECTRICAL—required by North East Firm. Applicants should be between 25 and 40 years of age and be prepared to travel. Minimum qualification O.N.C. and preferably with some inspecting experience. Please reply to Box No. 8051, Electrical Times, giving essential data and salary required. (S 355)

ASSISTANT

PROJECT ENGINEER CABLES

An Assistant Project Engineer is required in our Electrical Distribution Department.

The successful candidate will be responsible for the design and planning of main cable installation throughout the Steel Division.

Candidates should possess a Higher National Certificate or equivalent and have received a good technical and practical training in heavy electrical engineering.

Please write giving full details of age, experience, qualifications and any further information considered relevant to:

Superintendent.
Personnel Services,
THE STEEL COMPANY OF WALES LIMITED
(Steel Division),
Abbey Works, Port Talbot, Glam.

(S 400)

INSPECTION ELECTRICAL ENGINEER required for London Area. Applicants should be between 25 and 40 years of age with minimum qualification O.N.C. and with inspection experience. Reply to Box No. 8049, Electrical Times, giving essential data and salary required. (S 354)

INSPECTION ELECTRICAL ENGINEER required for Manchester area. Applicants should be between 25 and 40 years of age with minimum qualification O.N.C. and with some inspection experience. Reply to Box No. 8047, Electrical Times, giving essential data and salary required. (S 352)

MERZ AND McLELLAN have vacancies in their Esher Office for Mechanical Engineering Draughtsmen. Preferred age limits 25 to 35. Applicants should be experienced in Plant Layout Work, preferably, but not essentially, in connection with Power Stations. Salaries will be fully appropriate to experience, rising from about £870 per annum at age 25. Excellent working conditions. Pension Scheme. Canteen. Apply in writing to Merz and McLellan, Milburn, Esher, Surrey. (S 359)

REQUIRED for Polyphase Test Department: EXPERIENCED TESTERS OR IMPROVERS. These vacancies afford unique opportunity for experience on calibration of a wide range of integrating electricity meters and ancillary equipment. Staff status after qualifying period. Please enquire, Personnel Manager, Landis and Gyr Ltd., Victoria Rd, North Acton, W.3. (S 398)

Large Firm
Electrical Contractors

require

FIRST CLASS SITE ENGINEER

experienced in Steelwork Installation. Able to control large labour force and negotiate with Clients' Representatives. Attractive salary.

Write in confidence to:
Box No. 8039,
Electrical Times

(S 315)

ELECTRICAL DEVELOPMENT ENGINEER

With experience in design and testing of Transformers and Battery Charging equipment.

ELECTRICAL DEVELOPMENT ENGINEER

With experience in design and testing I.V. Control Gear.

These vacancies are due to the expansion programme of Britain's Leading Fork Truck Manufacturer, whose factory is situated on the outskirts of a pleasant country town, one hour west of London.

Apply in first instance with full particulars to:

J. Dewar,
Personnel Manager,
Lansing Bagnall Ltd.,
Kingsclere Road, Basingstoke,
Hants.

(S 378)

REPRESENTATIVE required for a firm of London Wholesalers, experienced and with good connections. Only men who can produce results need apply. This is a unique opportunity for the right man.—Box No. 8055, Electrical Times. (S 392)

SALES ENGINEER. Applications are invited from candidates of H.N.C. standard and with sales experience of H.V. and L.V. switchgear, variable speed drives, and rectifiers for our Ipswich Office staff. The appointment is pensionable and a Company car will be provided. Write in strict confidence to The Manager, Lancashire Dynamo Group Sales Ltd., 12 Princes St, Ipswich, giving details of age, education and training, qualifications and experience. (S 422)

SAO PAULO LIGHT S.A.—SERVICOS DE ELETRICIDADE, a Company in Brazil and a subsidiary of the Canadian corporation Brazilian Traction, Light and Power Company Limited, invite applications from suitably qualified men for the position of DEPUTY CHIEF of its PIRATININGA POWER STATION. The power station was completed about five years ago and is situated near Sao Paulo (population over 3 million), temperate climate, 2,200 ft above sea level). The plant comprised initially 2 x 100 MW, 1,800 r.p.m. steam turbo-generator units each supplied at 850 p.s.i., 900°F by one 850,000 lb/hr oil-fired boiler and has been recently expanded by the addition of two 125 MW reheat units, 1,800 p.s.i., 1,000°F. Applicants should have sound technical knowledge and good practical experience in the administration, operation and maintenance of steam-electric power stations; should also be of strong character with an aptitude for supervision and the maintenance of harmonious labour relations. Good salary, three years' agreement with first-class passage both ways; four months' paid leave after three years' service. Written application in the first instance should be made to Mr Osborne Mitchell, General Manager, Canadian-Brazilian Services Ltd., 9-12 Cheapside, London E.C.2. (S 423)

VACANCY for HIGHLY SKILLED ELECTRICIANS with wide industrial experience. Above basic pay with promotion prospects. Apply preferably in person to Unidare Ltd., Finglas, Dublin. (S 388)

WANTED

WANTED for prompt cash, ferrous and non-ferrous SCRAP: also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper Ltd., 17 Brady St, Bethnal Green, E.1. (S 1)

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WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service, fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co. Ltd., Stanmore, Middx. (S 2)

METALWORK.—All types of cabinets, chassis, racks, etc., to your own specification. — Philpotts Metalworks Ltd., Chapman St, Loughborough. (S 11)

FOR SALE

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co. Ltd., Honeypot La, Stanmore, Middx. Edgware 5566/9. (S 4)

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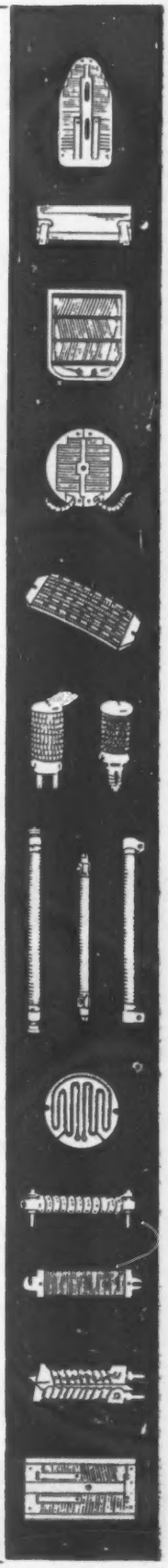

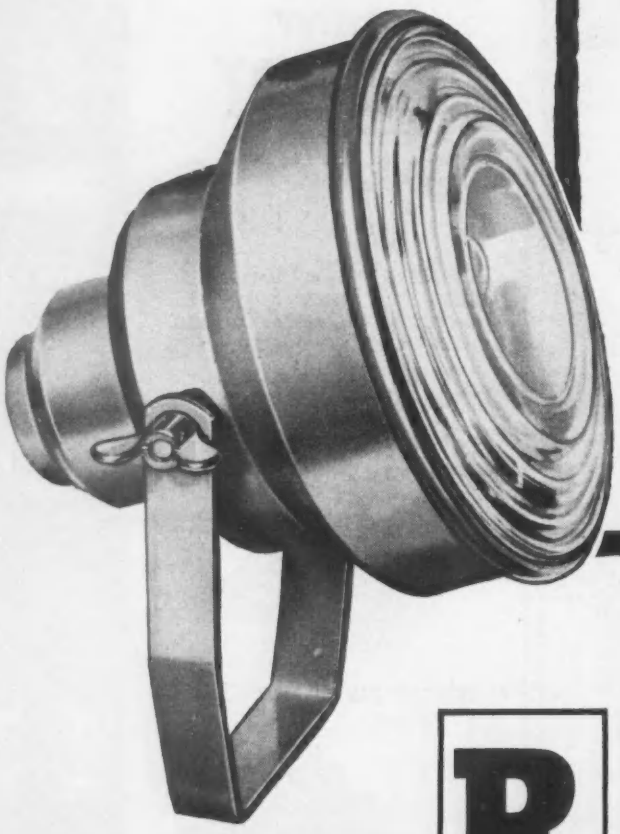

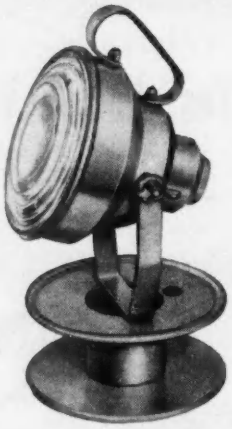

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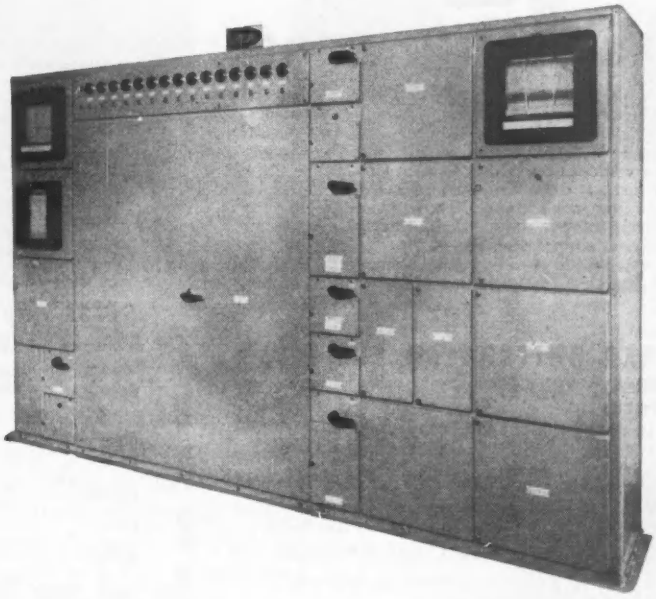

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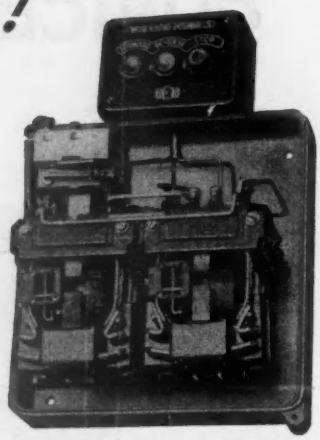

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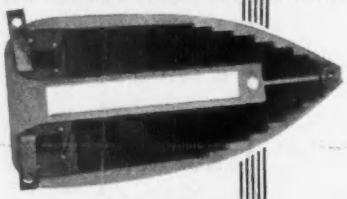

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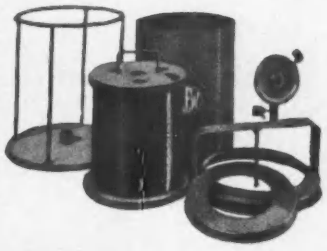

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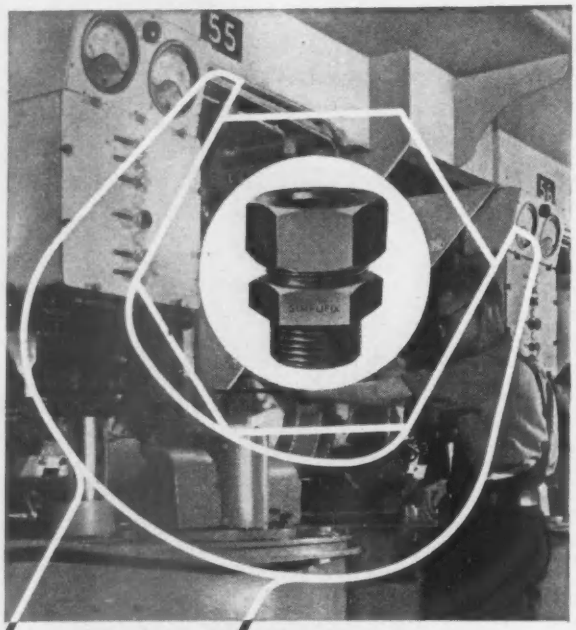

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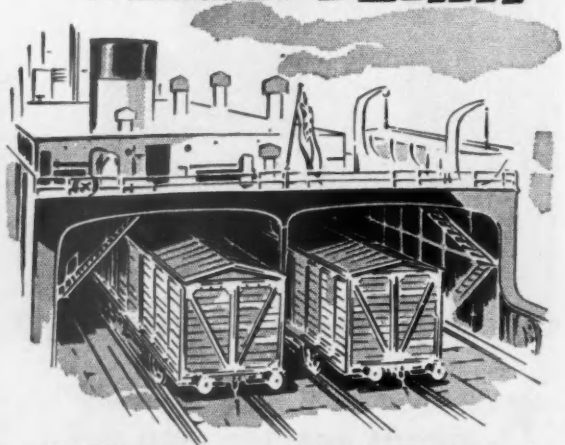

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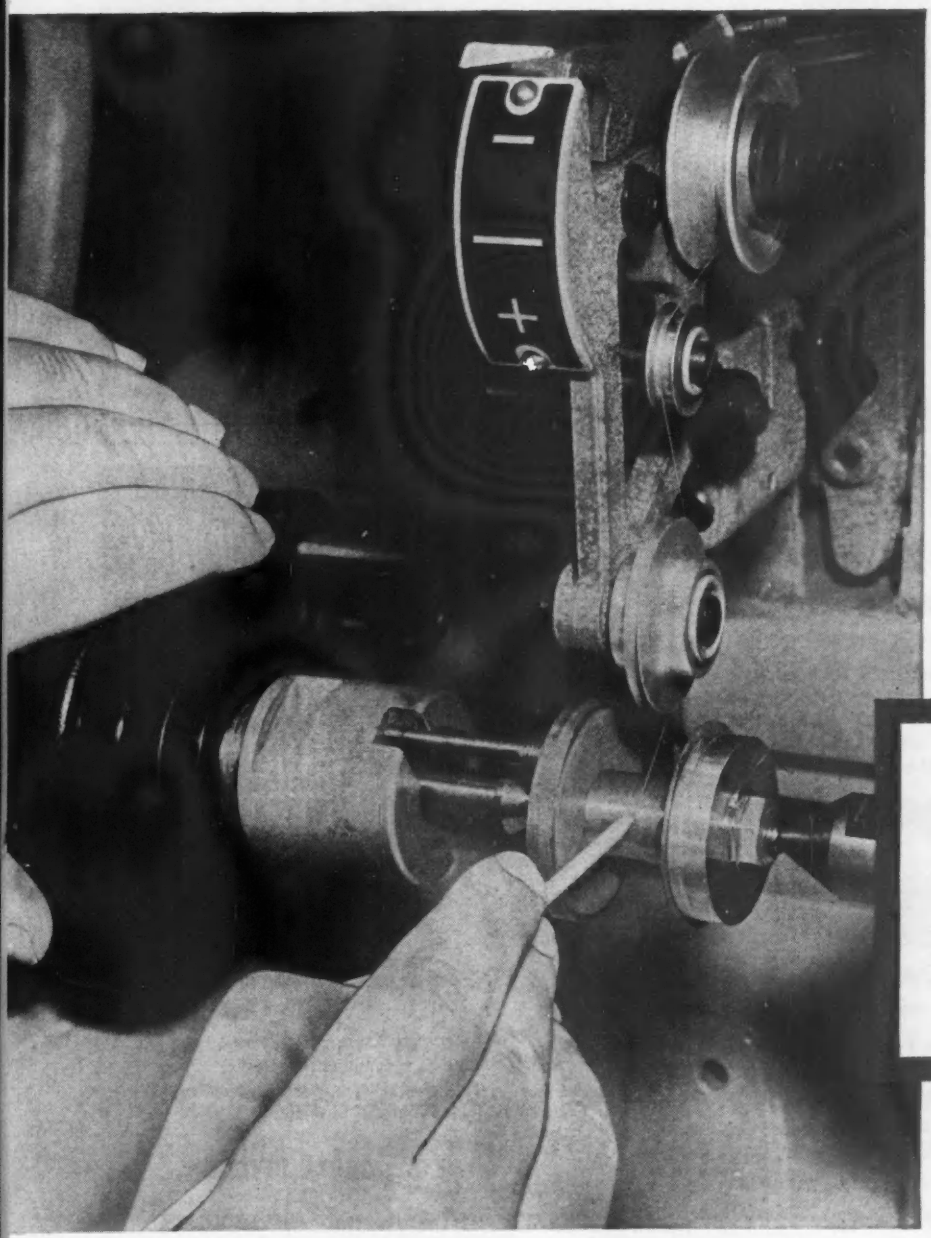

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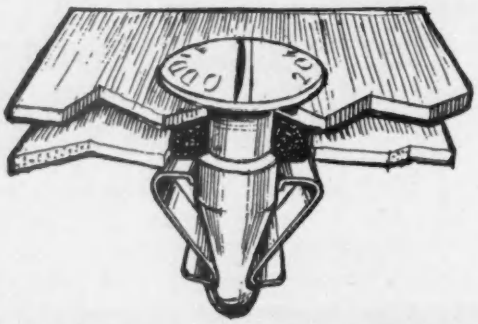

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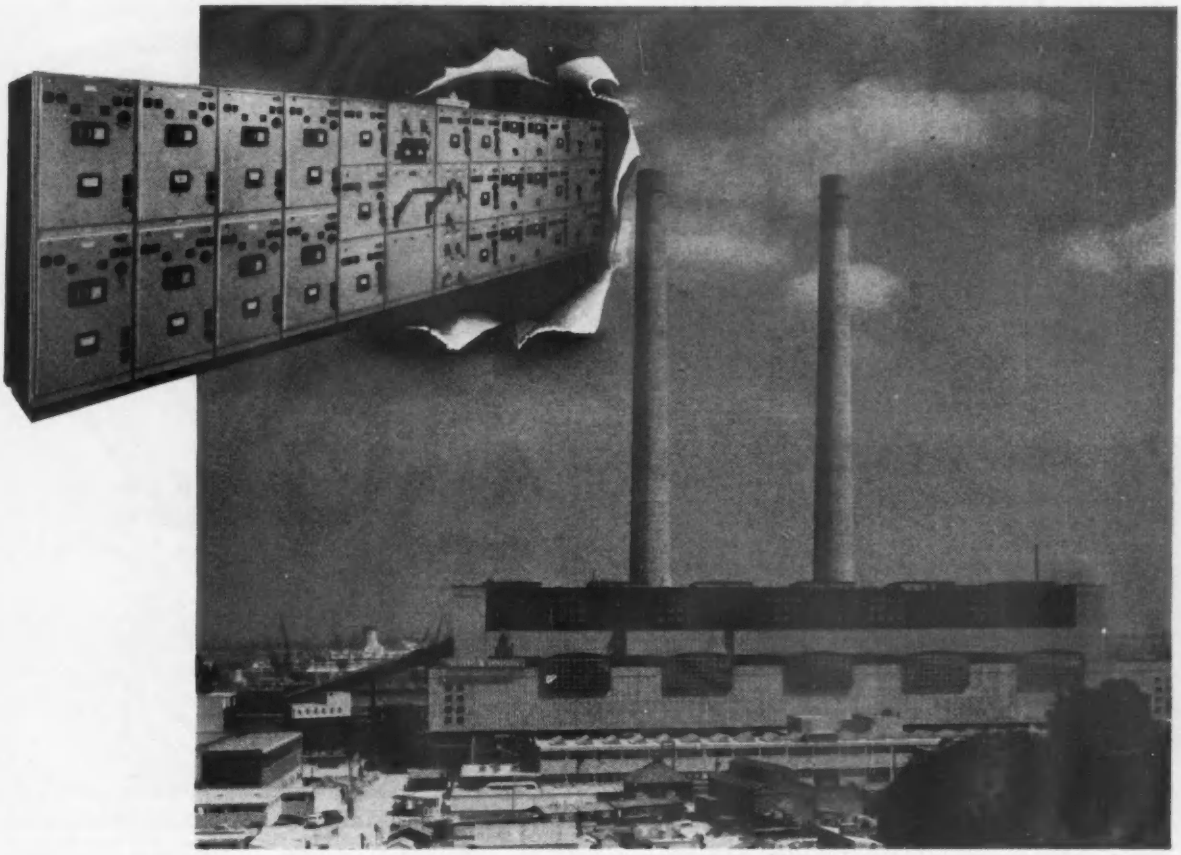

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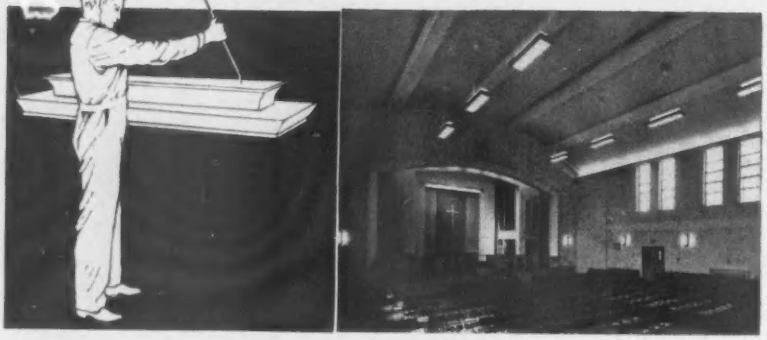

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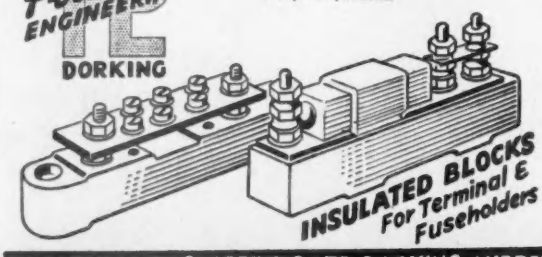

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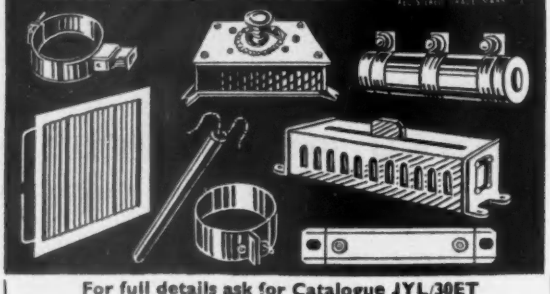

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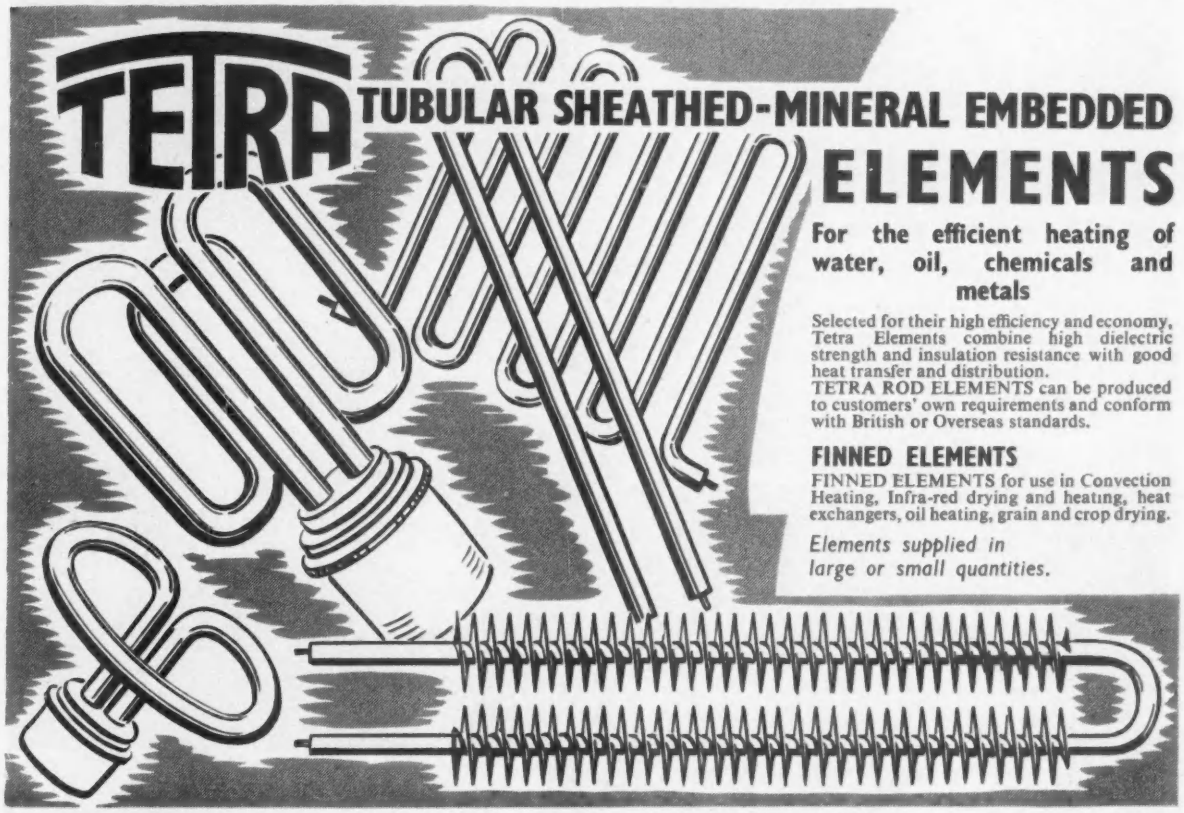


For the efficient heating of water, oil, chemicals and metals

Selected for their high efficiency and economy, Tetra Elements combine high dielectric strength and insulation resistance with good heat transfer and distribution.
TETRA ROD ELEMENTS can be produced to customers' own requirements and conform with British or Overseas standards.

FINNED ELEMENTS

FINNED ELEMENTS for use in Convection Heating, Infra-red drying and heating, heat exchangers, oil heating, grain and crop drying.

Elements supplied in large or small quantities.

THE TETRA ENGINEERING CO. LTD. TETRA WORKS - NORTH END RD. - WEMBLEY - MIDDX. *Tel.: WEMbley 1066 (5 lines)*

McGEOCH

manufacturers of

WATERTIGHT SOCKETS and PLUGS

including Heavy Duty and Multi-Pin patterns

INDICATOR LIGHTS

and

MULTI-LIGHT UNITS

to requirements

also

SWITCH and FUSE GEAR
LIGHTING FITTINGS etc.

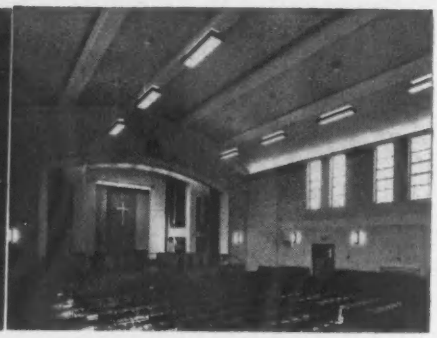
Registered Est'd McG 1832 *Trade Mark*

Associate Companies
VERITYS (MAXLUME) LTD., *for LIGHTING EQUIPMENT*
VERITYS (SWITCHGEAR) LTD., *for SWITCH and CONTROL GEAR*

WILLIAM McGEOCH & CO. LTD. (Dept. T.E.), BORDESLEY, BIRMINGHAM, 10 also GLASGOW and LONDON

Getting down TO LIGHTING MAINTENANCE

L.E.F. Raising and Lowering gear is the perfect answer to every problem posed by interior lighting installations in which the fitting must of necessity be out of reach and, consequently, tricky to service.
This gear enables maintenance staff to bring lightings fitting down to floor level, so that they can be dealt with quickly and conveniently. It out-dates cumbersome methods and is most economical in time and labour.
When you have a lighting problem, remember that it is most important to discuss your needs with L.E.F. at the planning stage; first to specify your technical requirements and secondly, to ensure suitable delivery.



L. E. F. RAISING & LOWERING GEAR

LONDON ELECTRIC FIRM LTD.
Brighton Road, South Croydon, Surrey
Telephone : Uplands 4871

Lighting units, each weighing over 2 cwt., are serviced by means of L.E.F. Raising & Lowering Gear at the Leysian Mission Hall
TIB 134A

ACME
MOTOR CONTROL GEAR

For A.C. and D.C. Marine and industrial applications

- A.C. and D.C. hand operated and automatic contactor starters
- Hand operated or motorised regulators for shunt field control
- Plain rotor regulators for slipring motors and variable speed panels, semi-automatic or fully pre-set
- Standard industrial or marine starters and control panels

Your enquiries for special control gear invited

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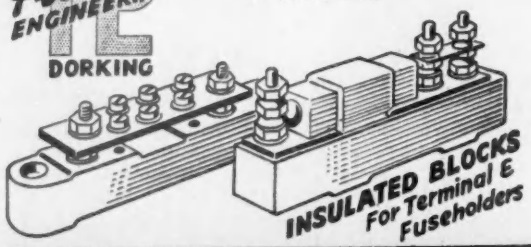
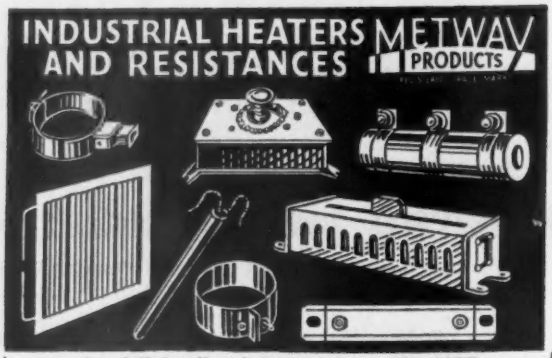
Planwell ENGINEERING LTD. DORKING

Get to know our capacity and speed in production. Write for particulars.
Ask to see our standard ranges or let us quote for special patterns.



PLANWELL ENGINEERING LTD. DORKING, SURREY
Phone: DORKING 4411 (3 Lines)

INDUSTRIAL HEATERS AND RESISTANCES METWAY PRODUCTS



For full details ask for Catalogue JYL/30ET
METWAY · KEMP TOWN · BRIGHTON

TETRA

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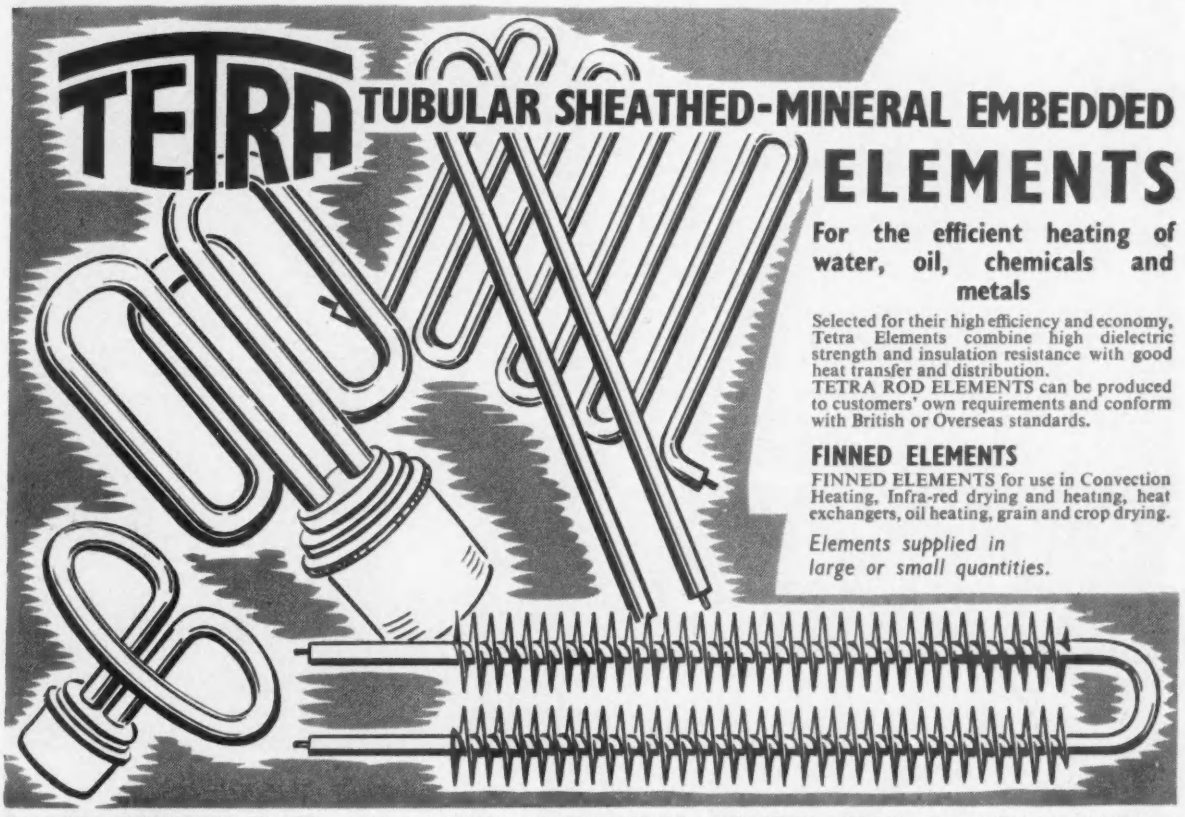

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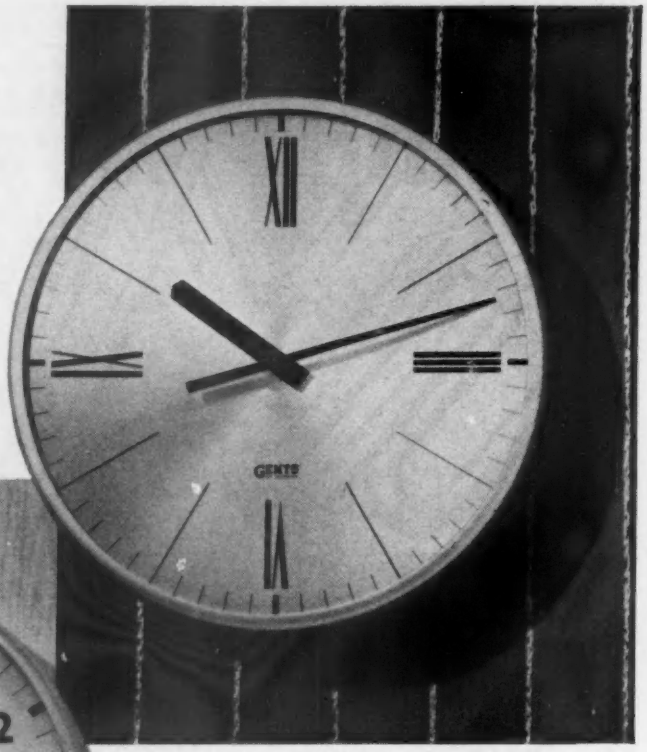
WILLIAM McGEOCH & CO. LTD. (Dept. T.E.), BORDESLEY, BIRMINGHAM, 10 also GLASGOW and LONDON

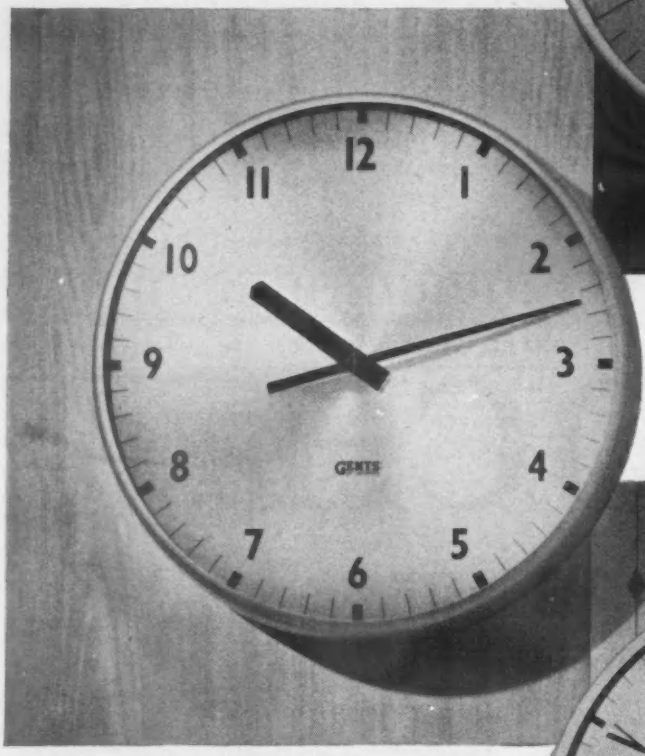
Maximum legibility and good taste are combined in the Gents wall clocks shown here.

Styled by a leading industrial designer they provide a choice of standard models which fit happily into present-day surroundings and décor.

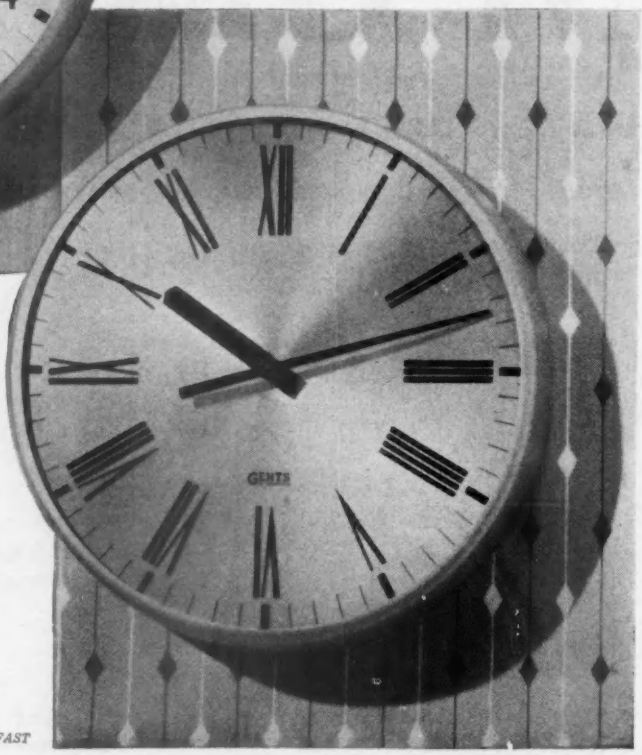
These and others in the extensive Gents range have been selected by the Council of Industrial Design for inclusion in Design Index.

All are available for operating either on A.C. Mains or as part of a Master Clock System.





In every way...Right!



Most models are now available from stock

Full details and literature on request

GENTS
OF LEICESTER

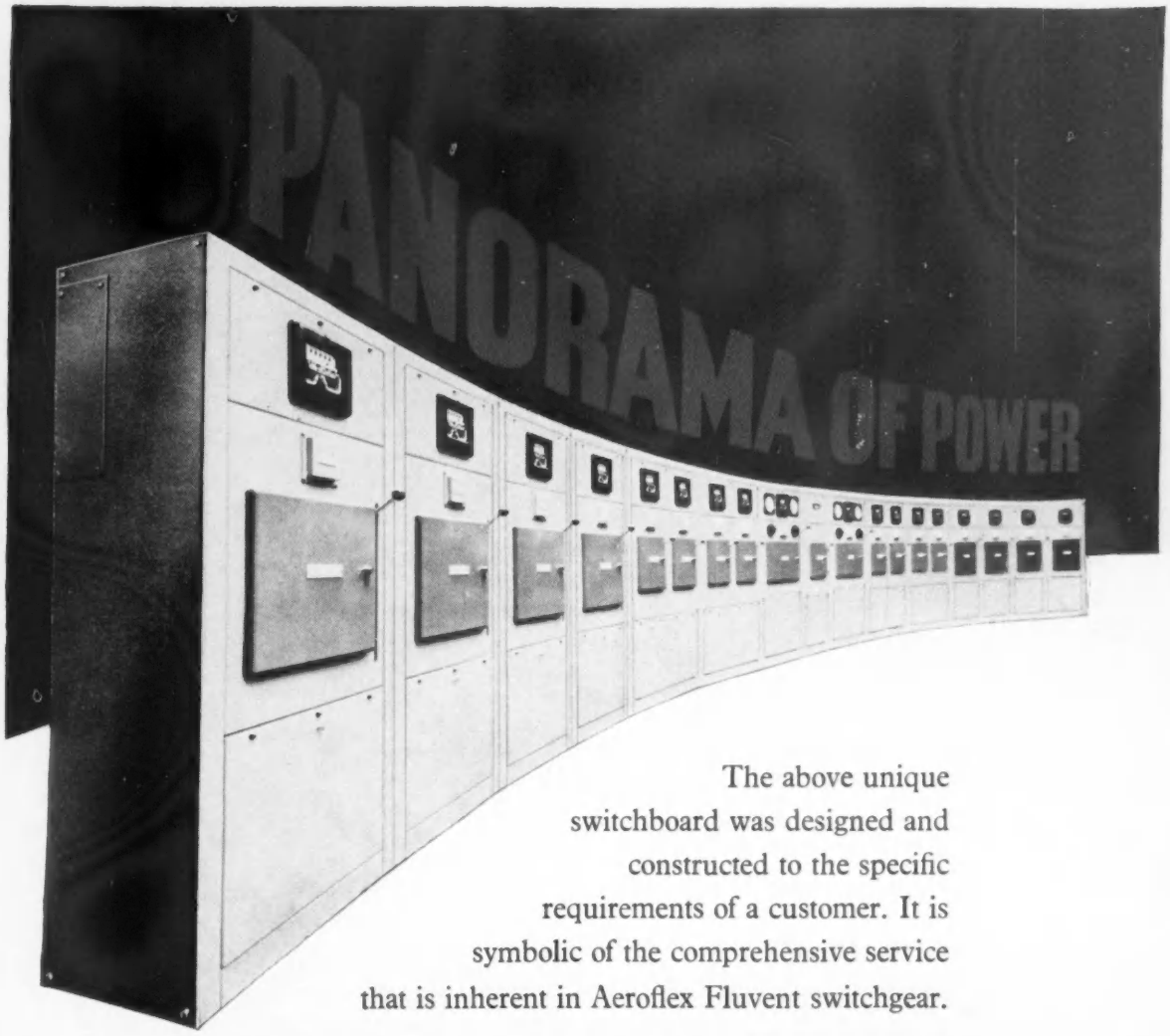
ELECTRIC CLOCKS

GENT & COMPANY LIMITED,
Faraday Works, Leicester. Telephone: 36151

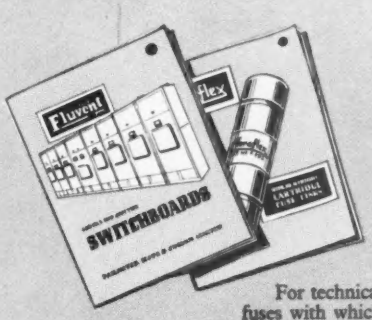
London Office & Showroom:
47, Victoria Street, S.W.1. Telephone: ABBey 6888

also at: BIRMINGHAM. BRISTOL. EDINBURGH. GLASGOW. NEWCASTLE. BELFAST

Printed in England by Gibbs & Bamforth Ltd., St. Albans, for the Proprietors, The Electrical Times Ltd., and published at Sardinia House, Sardinia Street, London, W.C.2.



The above unique switchboard was designed and constructed to the specific requirements of a customer. It is symbolic of the comprehensive service that is inherent in Aeroflex Fluvent switchgear.



AEROFLEX Fluvent

For technical details of these switchboards and the Aeroflex fuses with which they are equipped, please send for Lists SB2 and CF2.

Parmiter Hope & Sugden Ltd.

FLUVENT ELECTRICAL WORKS LONGSIGHT MANCHESTER 12

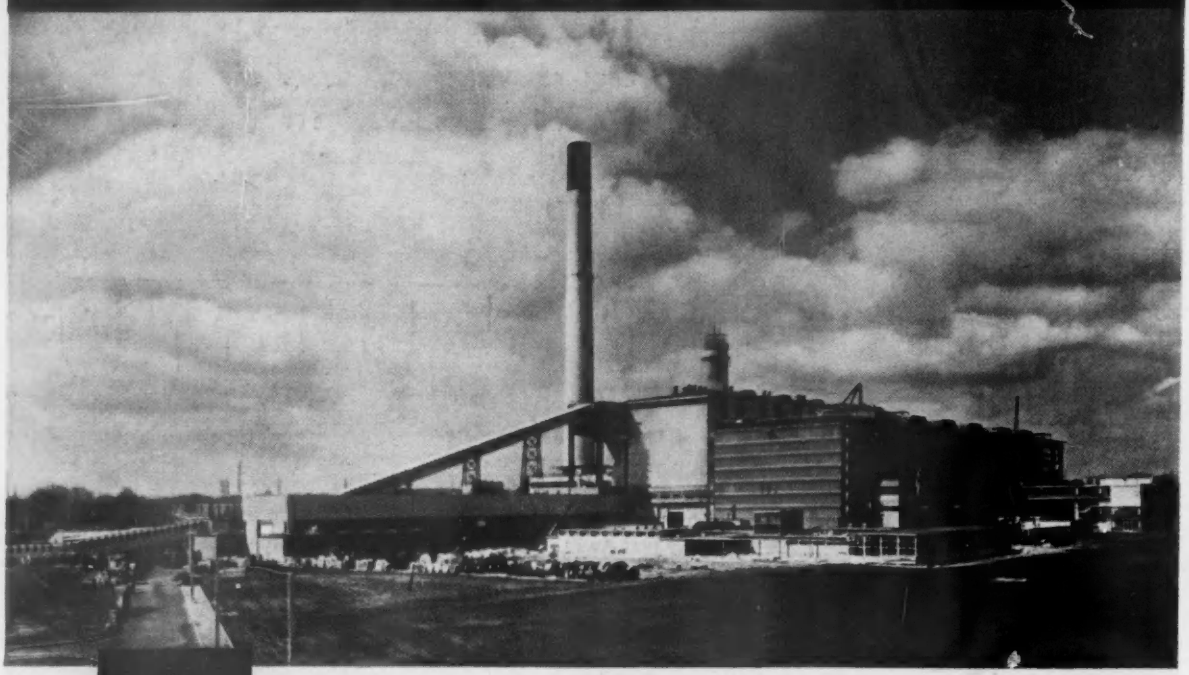
London : 34 Victoria Street, S.W.1 Glasgow : 5 Somerset Place, C.3. Birmingham : 39/41 Carrs Lane, 4.

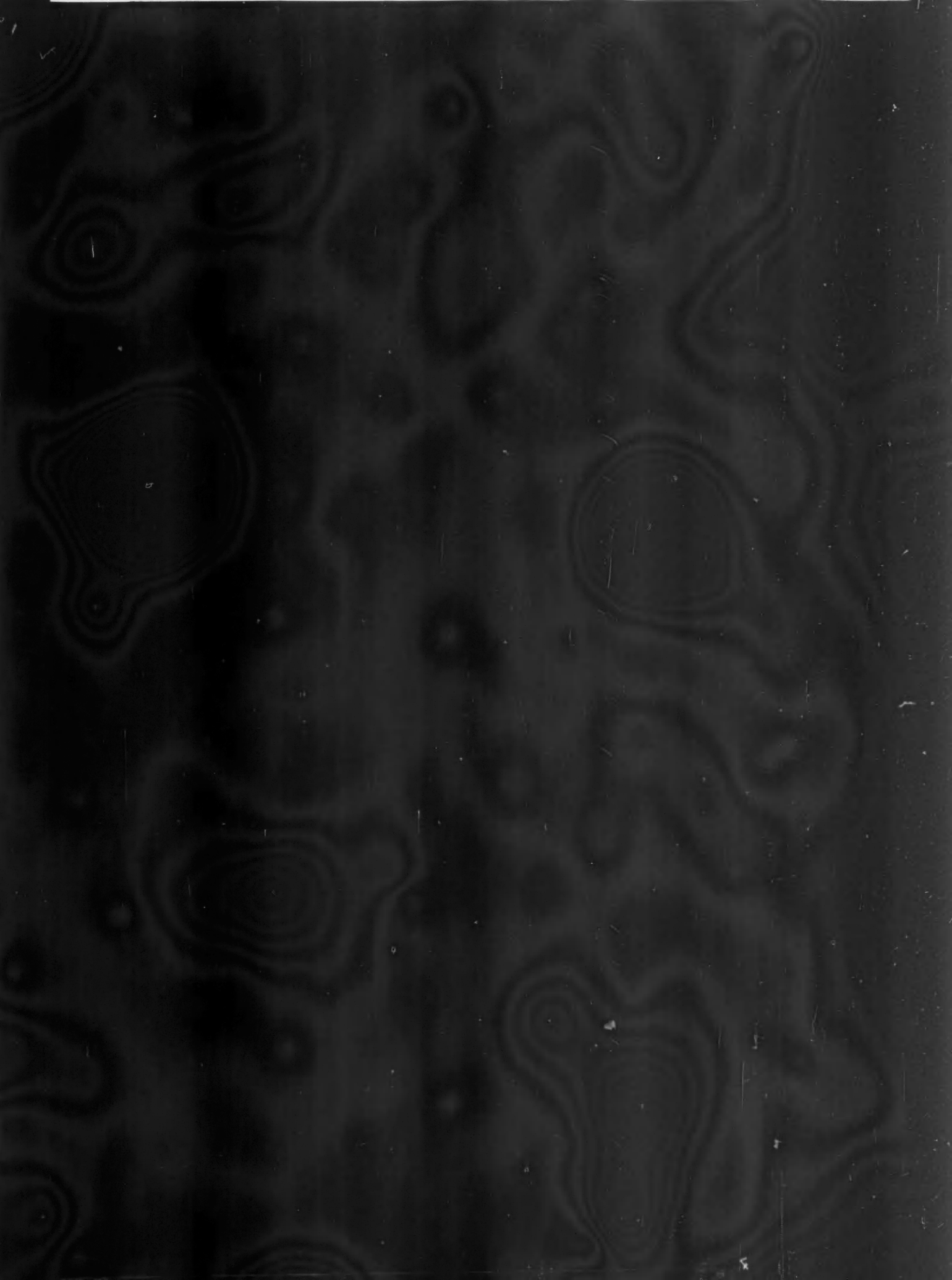
Nearly 5,000,000 lb per hour

On the 900 lb/sq. in. straight cycle this Company has supplied boilers of 30 and 60 MW output to the C.E.G.B. for both coal and oil firing, and they are in successful operation at their Brimsdown, Marchwood, Tilbury and Bold Power Stations.

John Thompson are engaged on the construction of three 120 MW units for operation on the 1,500 lb/sq. in. reheat cycle at the C.E.G.B's Richborough Power Station, and are now executing an order for two 350 MW units for operation on the 2,300 lb/sq. in. reheat cycle at the C.E.G.B's Drakelow 'C' Power Station; these units will be pulverised fuel fired, each producing 2,450,000 lb/hr., with live and reheat steam temperatures of 1,055 F.

Proof indeed of the confidence of the Central Electricity Generating Board in the ability of the John Thompson Group to design, manufacture, erect and commission power station steam generating plant.



JOHN THOMPSON WATER TUBE BOILERS LIMITED · JOHN THOMPSON GROUP

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